Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

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0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
3	Preserved fish	8	Composition
4	Oils	9	Miscellaneous

Issued with the approval of the Bureau of the Budget, December 29, 1953

0.8 WATER TREATMENT IS A 'MUST' IN THE MODERN FOOD PLANT

Nordell, Eskel (The Permutit Company, New York City)
Food Engineering 27, No. 4, 89-99 (April 1955)

The food-industry uses for water are: processing, cooling, operating the steam boiler, and the general uses. Some of the various impurities that are objectionable in water are sediment, turbidity, color, organic matter, microorganisms, tastes, odors, hardness, iron, manganese, and hydrogen sulfide. More specifically, the suitability of a water depends entirely upon the process in which it is to be used.

Since various water supplies differ markedly in composition, no single treatment method will be suitable for all purposes. However, the use of one or more of the seven different treatment processes outlined below will make almost any water suitable for a specific requirement of the food industry:

Softening with sodium-cation exchanger. -- Water to be softened is admitted to the upper portion of a steel shell and passed downward through a zeolite bed. The hardness-forming elements -- calcium and magnesium -- are removed by the cation-exchange action of the zeolite. Sodium is given in exchange for the calcium and magnesium. The zeolite is regenerated with salt.

Hydrogen-cation exchanger. -- This process removes sodium as well as calcium and magnesium, and replaces them with hydrogen. The total solids content of this water is reduced by the extent of the bicarbonate content of the raw water. The ion-exchange material is regenerated with acid (usually sulfuric) instead of salt. Waters that contain some sulfates and chlorides as well as bicarbonates form sulfuric and hydrochloric acids when they are passed through the hydrogen-cation exchanger.

(over)

 ABSTRACTER: Martin Heerdt

2.111 NET PRESERVATION IN THE TROPICS

Burdon, T. W.
World Fishing 4, No. 4, 154-157 (April 1955)

The need for cheap protein foodstuffs has increased interest in fishery activities in the tropics. Although many governments have sponsored programs of fisheries development, the problem of the preservation of fishing gear is rarely recognized. Gear preservation is of particular importance in the tropics. The strong sunlight and high temperature of the water, which often contains large numbers of fiber-destroying bacteria, accelerate the deterioration of fishing gear.

The price of gear and other essential equipment in this area has risen out of proportion to the returns the fisherman receives for his catch. Although programs designed to increase the catch per fisherman would be helpful, improving the methods of gear preservation would reduce maintenance, yet not disturb the existing industry.

It is clear that the same preservatives that work in the cooler waters do not apply under tropical conditions. The range of materials used should vary with type and construction of gear. The efficiency and duration of the protection given against rotting and oxidation of the fibers is of great importance. Copper compounds that are effective in temperate areas are ineffective in the tropics, as strong sunlight decomposes these preservatives.

Internal abrasion is more of a problem in the tropics than external wear. Preservatives which decrease it often reduce the tensile strength of the twine causing undesirable knot slippage.

(over)

 ABSTRACTER: Lois Elgin

2.118 MARIN INSTALLS IMMERSION FREEZING SYSTEM ON GULF EXPLORER

Anonymous
Southern Fisherman 15, No. 4, 101 (April 1955)

A new type immersion-freezing system has been installed aboard the recently completed shrimp trawler, Gulf Explorer. The freezing tank is a structure of stainless steel, little larger than a chest-type home freezer. It is located next to the hatch leading to the fish hold.

Construction of equipment. -- Hermetically sealed when closed, the all-welded tank is insulated with 4 inches of foam glass. The top-opening freezing compartment is separated from the coils which use Freon 12 as the refrigerant. In the tank is a 0° F. solution of water, salt, and a form of sugar that is kept in constant violent circulation traveling through the coil section and back through the freezing section.

The pump is operated by a completely enclosed hydraulic motor to prevent interruption in power supply during rough weather. Two diesel-powered compressors handle the refrigerant, one for the freezing unit and the other for the holding room. The engines have exceptionally heavy steel bases intended to reduce vibration.

The holding room is cooled by plates which function at -20° F. Instead of icing up, these plates form a fine dry snow which drops off of itself -- thus making them self-cleaning.

A reserve freezing capacity can be built up by starting the equipment operating in advance of the time it will be needed. A coating of sub-zero ice forms on the coils and is melted off when the temperature of the freezing solution rises.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

0.5 A MARINE BACTERIOPHAGE

Spencer, R. (Humber Laboratory, D.S.I.R., Hull, England)
Nature 175, No. 4459, 690-691 (April 16, 1955)

Identification and classification of marine bacteria is difficult because they give negative results in most common biochemical tests. To overcome this difficulty, the author decided to try the use of bacteriophage. Attempts were made to isolate bacteriophages active against certain luminous marine bacteria probably identical with Bacterium phosphoreum. These bacteria have been shown to make up a large part of the flora of many species of fish.

A broth medium composed of 4-percent 'Lemco,' 4-percent peptone, 75-percent aged sea water, and 25-percent tap water (pH 7.6) was used to isolate the bacteriophage. Sea water (300 milliliters) obtained about 10 miles east-south-east of Aberdeen and 8 milliliters of an overnight sea-water 'Lemco' broth culture of each of 4 different strains of luminous bacteria were added to 100 milliliters of the broth medium. The inoculum in broth was then incubated at 20° C. for 48 hours and Seitz-filtered. The filtrate that resulted was tested for lytic action on the surface of sea-water 'Lemco' agar plates which had previously been inoculated with the appropriate bacterial strain. After many repeated isolation runs, a single bacteriophage was isolated, purified by several single-plaque isolations, and increased in titre by plate lysis.

Since the bacteriophage was obtained from a mixed culture, it was possible that it did not originate from the sea water. To check this possibility, each of the four different strains of luminous bacteria used in the mixed medium were tested for lysogenicity by Fisk's method. None of these strains was found to be lysogenic. These same four strains were also grown together in the other samples of sea water under conditions identical with those used in the experiment without producing futher bacteriophage.

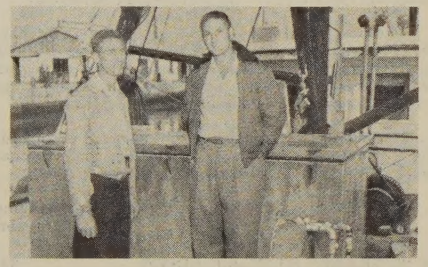
(over)

 ABSTRACTER: Martin Heerdt

2.118 (Cross Reference: 1.85)

Freezing shrimp. -- On the fishing grounds, the shrimp are headed and placed in metal baskets. When first placed in the freezing solution, the baskets are given a shake to separate the shrimp and permit a free flow of liquid. After freezing, which takes place in a matter of minutes, the baskets of shrimp are removed from the tank, and allowed to drain. The shrimp are then poured into cartons and stored in the holding room. The shrimp are entirely separate as they come from the tank and look no different from fresh, unfrozen shrimp, although they are as hard as stone to the touch.

Shrimp quality. -- The result of this remarkably fast processing time is a shrimp which, after thawing, passes the tests for the freshly caught product. The frozen shrimp keep without glazing due to the coating of salt and sugar left on the shells. This coating is evidenced only by a slight shininess and need not be washed off before cooking. No further processing is necessary after the shrimp arrive in port.



0.5

This is the first reported isolation of a bacteriophage active against marine bacteria and the second reported isolation of a bacteriophage active against luminous bacteria.

The distinguishing characteristics of marine organism are an ability to grow at temperatures near 0° C., a preference for salinity in the range 3-4 percent or at least as good growth in this range as at 0.5 - 1 percent, and, in general, a lower heat tolerance than that found in terrestrial forms. The bacteriophage isolated by the author possesses all of these characteristics.

0.8

Demineralization by ion exchange. -- The anion exchanger uses certain synthetic resins that are able to remove acids (sulfuric and hydrochloric) from solution in much the same manner as the cation exchangers remove basic elements. Anion-exchanger resins are regenerated with an alkali.

Cold lime process. -- In this process the bulk of the hardness is precipitated as calcium carbonate and magnesium hydroxide by adding measured amounts of hydrated lime or hydrated lime and soda ash. A small amount of coagulant (generally aluminum sulfate) is used to flocculate the finely divided precipitates.

Hot lime-soda process. -- This process for softening boiler-feed waters is carried out at 212° F., is more effective in reducing the total hardness, requires no coagulant, removes silica more economically if dolomitic lime or activated magnesia is used, and deaerates the water.

Iron and manganese removal. -- Iron and manganese present as soluble bicarbonates may be removed by (1) aeration and filtration, (2) treatment with manganese zeolite, or (3) a manganese zeolite water softener.

Hydrogen sulfide is easily removed by aeration and detention followed by chlorination to oxidize any sulfide residuals.

Clarification and sterilization. -- Turbid or highly colored surface waters can be clarified by coagulation, settling, and filtration. The usual coagulant is sulfate of alumina. Ferric sulfate may also be used.

Taste and odor removal. -- Activated carbon is commonly used for abolishing objectionable tastes and odors from water. The carbon powder may be added to the water or used in the form of filters having beds of granular activated carbon.

2.111

The preservatives used must not affect the flexibility of the nets, reduce their efficiency, or make them more difficult to handle. Preservatives, that add greatly to the weight of the net, are to be avoided, since little mechanical power is used in the tropics. Tung and linseed oil are preferred as they (1) waterproof the twine, (2) add little to the dry weight of the net, and (3) reduce the penetration of bacteria into the twine.

Color of nets may be of importance in some types of fishing. The cost and type of procedure and the time and equipment required are factors to be considered when choosing a method of gear preservation. It may be necessary to re-treat every 7 to 10 days, therefore slow drying preservatives are a disadvantage. Customary and racial preferences are human factors which help determine the type of preservative to be used.

Cutch, derived from various barks, by hot or cold infusion, is presently used in areas where the color of the nets is not important. Treatment with cutch is usually followed by washing and steaming to fix the preservative. The use of chemical mordants, such as potassium bichromate or copper sulfate, is unknown. Variations include the use of egg white, coagulated animal blood, tung oil, and linseed oil. Net preservation appears quite primitive since the practices used are the result of centuries of experience. The fishermen, who are usually very careful and conscientious, obtain surprising results. The whole problem of gear preservation is a challenging one offering a wide market for suitable preservatives.

9.4 IT'S THE TEAM SPIRIT THAT COUNTS HERE

Baxter, R. P.
World Fishing 4, No. 5, 180-182 (May 1955)

The Morecambe Trawlers, Ltd. in England are in their 35th year of existence. This fishermen's society, mainly in the shrimp business, was founded when business was difficult, and the fish buyer would more readily do business with a cooperative than with an individual fisherman. Membership in the society grew until about 30 boats were pooling their resources and splitting the profits.

The boat used by these fishermen is the 33-35 foot half decker. A 16/20 h.p. diesel is used and the propeller shaft is through the starboard quarter. The boat has a 4-foot draught which allows it to work in the shallow channels where shrimp are found at certain times of the year. The fisherman uses a 19-foot beam trawl with 9-inch oak bobbins on the underside for a footrope for dragging the channels. Anywhere from 1/2 hour to 2 hours may elapse before the net is hauled into the boat. Between 3 and 4 drags are made before the boat returns home for the night.

The haul taken by the trawl consists of many unwanted fish including plaice, dabs, soles, roker, codling, whiting, weavers, and small crabs. These must all be sorted, discarded and returned to the sea before the actual sorting of the shrimp takes place. The shrimp are then washed and boiled on board the fishing boats. This shrimp catch is unloaded daily at the warehouse after the day's fishing has been completed.

When the catch is landed, the pickers peel the shrimp by hand. Usually this process takes place in their homes. These pickers are paid by the pound and competitions have often taken place to determine the fastest picker. According to the company's records, in one year two pickers peeled

(over)

 ABSTRACTER: Marjorie Zachow

9.11 VISUAL DETECTION OF TEMPERATURE-DENSITY DISCONTINUITIES IN WATER BY DIVING

Limbaugh, Conrad and Rechnitzer, Andreas B.
Science 121, No. 3142, 395-396 (March 18, 1955)

NOTE ON A VISIBLE THERMOCLINE

Banner, Albert H.
Science 121, No. 3142, 402-403 (March 18, 1955)

"Skin divers" have seen and felt thermoclines incidental to their work on other objectives. Visual detection has been achieved in the following ways: (1) indirectly by observing the vertical distribution of living organisms and other suspended particles, (2) by viewing the refractory plane at the temperature-density discontinuity, and (3) by seeing the "stream" lines (refraction patterns) formed during the mixing of water masses of different density.

When water masses are relatively stable and undisturbed and the interfacial plane is flat and parallel to the surface, it is necessary to be within a few inches of the thermocline level to be able to detect it. In areas of turbulance where mixing is beginning, undulations of the refractory plane can be noted from positions more remote from the thermocline level. "Mirror" pools have been noted on the sea floor in areas where cold water masses have recently departed leaving pools of cooler water in small depressions. These pools have a high degree of refraction and even reflect images.

It is noted that the phenomena mentioned herein have been observed only when conditions are such that temperatures and densities of adjacent water masses are rather abruptly different. In all cases reported, the thermal gradients have been verified sensually by the diver.

(over)

 ABSTRACTER: M. R. Greenwood

9.15 PRELIMINARY NOTES ON THE CULTURING OF GYMNODIUM BREVIS DAVIS

Wilson, William B. and Collier, Albert (Fish and Wildlife Service, Galveston, Texas)
Science 121, No. 3142, 394 (March 18, 1955)

Catastrophes, commonly called red tides, have been associated with the high incidence of the marine dinoflagellate Gymnodinium brevis Davis in the plankton populations.

Preliminary field investigations and culturing of a related species, Gymnodinium splendens, provided information that simplified the culturing of G. brevis. A medium composed of sea water, vitamin B_{12} (0.05 μg./100 ml.), and Van Niel's medium for sulfur bacteria (diluted 500 times) produced a culture containing more than 2500 cells of G. splendens per milliliter from an initial inoculum of two cells per milliliter in about 6 weeks. Gymnodinium brevis responded better when the components of Van Niel's sulfur bacteria medium were diluted 1000 times and the vitamin B_{12} was increased to 0.1 μg./100 ml.

Using the latter medium as a base and a standard, inorganic compounds, organic compounds, vitamins, and extracts of materials known to occur in nature, for example, soil and fish, were tested. By adding Florida peat extract, results were improved, but repeated experiments gave inconsistent results. A hot-water extract of beef liver further increased growth. Later thiamine and biotin for the liver extract was substituted. The addition of the disodium salt of ethylenediamine tetraacetic acid (EDTA. Na), a metal buffer, (also designated ethylenedinitrilo tetraacetic acid disodium salt) increased the reliability of growth. Soil extract, a more generally available material, can be substituted for Florida peat extract with a slight reduction in growth.

(over)

 Reprinted in part

7.80 TASTE COMPARISONS: TWO SAMPLES OR THREE?

Gridgeman, N. T. (Division of Applied Biology, National Research Laboratories, Ottawa, Canada)
Food Technology 9, No. 3, 148-150 (March 1955)

In a balanced experiment to test the relative power of the pair, duo-trio, and triangle tests, it was shown that pair and triangle tests are about equally powerful and appreciably superior to duo-trio tests.

Three common arrangements (experimental designs) are used for presentation to the taster of two similar samples for comparison. The pair test involves simultaneous presentation of one coded aliquot each of samples A and B with the question, "Which is the stronger?" or "which is the regular sample?" In the duo-trio test, three aliquots are presented, two of which are duplicates. The question is "Which of two coded samples is identical with the third coded sample?" In the triangle test, three coded samples are presented, two of which are identical, and the question, "Which is the odd sample?" The probability of a chance correct answer is one in two for the pair and duo-trio tests and one in three for the triangle test.

The probability, p, that a taster gives the correct answer in one of the three arrangments is a limit of the ratio R/N, where R is the number of correct judgments in N trials, as N becomes very large. The quantity, p, is a blend of two probabilities: p_d, that of correction discrimination, and, p_g, that of a lucky guess. Any attempts to assess relative merits of different arrangements must rest on experimental estimates of p_d for each design under the same conditions. A criterion of merit was best met by the statistic concept of power, defined as the probability of correctly rejecting, at some predetermined significance level, a false null hypothesis. The null hypothesis was "no difference between samples A and B" and a significance level of 5 percent was chosen.

(over)

 ABSTRACTER: John A. Dassow

BRITISH SHRIMP COOPERATIVE

RED TIDE CULTURE

TEMPERATURE-DENSITY DISCONTINUITIES

TASTE COMPARISON TESTS

9.15

By substituting a group of trace metals (Fe, Zn, Mn, Sr, Rb, Mo, Co, Cu, Cr, Ti, Al, Si, and Zr) for soil extract, a medium that supported good intitial growth of G. brevis was obtained, but continuous subculturing was not successful.

Investigations seemed to indicate that heavy rainfall and subsequent river discharge are instrumental in initiating a bloom of G. brevis. On the basis of this belief, culture experiments whereby mediums were prepared by adding river water, extracts of peat soils from the western Florida coastal region, or both, to sea water from the Gulf of Mexico were made. Sea water containing 4 to 10 ml. of river water per 100 ml. supported limited growth of G. brevis. Seven to 10 ml. of river water or peat extract per 100 ml. of sea water is better, and peat extract or mixtures of peat extract and river water at this concentration proved more productive than river water alone. The addition of vitamin B_{12} (0.05 μg./100 ml. of medium) improved the reproducibility and growth.

Laboratory cultures of G. brevis have attained homogeneous concentrations exceeding 2 million cells per liter. These cultures were toxic to Mollienesia sp. and Mambras vagrans as test fish.

7.80

In a balanced experiment to test the relative powers of the designs described, six subjects made 18 replicate parallel trials of the three methods on two slightly different samples of each of three materials. These were mixed primary flavors (bitter, acid, salt, sweet-abs.) served at slightly different concentrations, canned tomato juice altered by boiling, and ground beef cooked with and without 0.4 percent monosodium glutamate.

The summations of the trials are shown in table 1, together with the derived estimates of p_d. On a "cost" basis, i.e. the relative amounts of tasting required to achieve a result of maximum significance, it appeared that the duo-trio test was the least economic, and the pair test was the most economic. It was shown that triad tests become relatively more costly as N increases.

TABLE 1

Numbers of correct judgments, R, out of a possible maximum of 108, and derived estimates of the probability of discrimination, p_d

Kind of test	Mixed flavors		Tomato juice		Minced beef	
	R	p_d	R	p_d	R	p_d
Pair	75	0.39	61	0.13	72	0.33
Duo-trio	65	0.20	58	0.07	66	0.22
Triangle	50	0.19	38	0.03	53	0.24

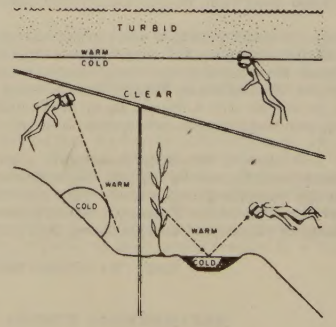
9.4 (Cross Reference: 2.14, 1.85)

1,080,000 shrimp. When the shrimp have been peeled, they are returned to the society's kitchen where they are cooked in a butter and spice mixture, cooled, packed in cartons, sealed over with butter, and topped with a tight lid. This process results in the famous Morecambe potted shrimp.

The shrimp caught by the Morecambe Trawlers are famous throughout England as well as abroad. When cooked, the shrimp turns from its original dull gray to the brown color which distinguishes this species of shrimp. It is claimed that there is a succulent richness about these shrimp that is not found elsewhere. Although this richness has increased its perishability, it has also increased its demand. This demand makes necessary the freezing of shrimp during the months when catches are plentiful. After peeling, the shrimp are frozen at -40° F. and stored at -10° F. in the society's own quick-freezing plant. Thus the market during the less plentiful winter months can be supplied from the society's cold stores.

The society has a committee of management, made up of the fishermen themselves, who deal with capital expenditure, changes of policy, and subjects concerning the membership. The individual fisherman enjoys belonging to this society for the every-day pressure of prices, markets, quality, and poor catches has been relieved from his shoulders. He is paid a more or less fixed price for his catch thus enabling him to see how he is faring financially. The annual profit of the society is distributed to the working members in the form of a bonus on a percentage basis -- the boat landing the most and best catches receiving the biggest bonus. Thus the fishermen of Morecambe have a good name, a good business, and a good standard of living.

9.11



2.116 PROFITABLE KING CRAB FISHERY MADE POSSIBLE WITH MODERN ELECTRONIC EQUIPMENT

Blackford, William M.
Fishing Gazette 72, No. 4, 44-45, 154A (April 1955)

The Deep Sea, a 144-foot trawler, fishes for crab 20 to 100 miles offshore in a 70 x 110 mile area of the Bering Sea. King crab are located by prospecting along loran lines of position. A radar reflector buoy (see illustration) is then "planted." Drags are plotted on a Navy maneuvering board (H.O. 2665-a) which is used as a plotting sheet. Radar bearings and ranges are taken at half-hour intervals during a 2-hour drag. This permits great precision in laying out a series of drags. It is possible to follow the pattern of both migratory movements of the crab and ocean currents. The position of the initial buoy is maintained for several days, and its position is permanently recorded for future reference by means of celestial fixes and loran. Sometimes a second buoy or even a string of buoys about 10 miles apart are employed.

Inauguration of the use of radar-reflecting buoys nearly doubled the catch of crab in terms of crabs taken per unit of fishing effort.

The buoy is a type used in hydrographic survey work, readily constructed aboard ship using a wooden framework with a 50-gallon oil drum as float. The framework is 25 feet in length with the drum as the center, a 200-pound weight at the bottom, and the radar reflector at the top. The center of the reflector is 12 feet above the water. A second 50-gallon drum is used as lead buoy, the whole being securely moored with chain and cable to a 65-pound kedge anchor. These buoys with a 2:1 anchor scope will ride out any gale. Out of 125 buoys set during the past five years, only two have been lost, one of which was caught in ice floes and later recovered.

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 ABSTRACTER: M. E. Stansby

2.115 BETTER QUALITY FISH FROM ALUMINUM HOLDS

Anonymous
National Fisherman 36, No. 3, 11 (April 1955)

Dr. G. M. Dreosti, director of the South African Fishing Industry Research Institute, reports the latest method of lining fish holds is with panels consisting of two sheets of aluminum alloy bonded together with expanded rubber insulation. The original built-up steel stanchions, wooden pounds, and shelves are replaced with aluminum alloy extrusions. The advantages of using aluminum are: (1) smooth, bright surface throughout the entire hold facilitating cleaning, (2) the insulation provided is sufficient to reduce the quantity of ice necessary by as much as 60 percent, and (3) modern marine aluminum alloys have such great resistance to corrosion by salt water that they require no maintenance other than regular hosing down.

The use of aluminum for deckhouses, deck ladders, funnel casing, radar structures, and lifeboats in modern European trawlers represents a substantial saving in weight in a location where it is of the greatest benefit to stability of the vessel. This improved stability makes it possible to place much additional accommodation above deck without reducing the metracentic height from that of an all-steel vessel. Freedom from corrosion reduces cost of upkeep and increases the life expectancy of the structure.

 ABSTRACTER: D. T. Miyauchi

2.118 "CATCH-AND-PROCESS" TRAWLER

Kerr, John (Scottish "Daily Express")
Food Engineering 27, No. 4, 114, 117 (April 1955)

The new British fishing trawler Fairtry is the latest vessel to combine catching with processing of fish on the high seas. This vessel catches about 1,500 tons of fish, and prepares and freezes about 600 tons of fillets on each of its 2 1/2-month trips from the British Isles to Greenland or the Newfoundland banks. In addition to fillets, 100 tons of fish meal and 20 tons of fish-liver oil are obtained from the waste products.

The Fairtry, a 2,600-ton vessel that measures 245 feet in length, trawls from the stern of the vessel. Fish that are unloaded from the trawl on the open deck pass through hydraulically controlled hatches and slide by chute to bins on the processing deck. Here the catch is divided. The rough fish are gutted, hand filleted and frozen; the cod, haddock, and coalfish are sent through a mechanized fillet line. At the rate of 28 per minute, the fish are placed in a slot and guillotined on a circular cutter. The headless fish then travel tail first into a filleting machine. Here they are de-finned, and the fillets removed, trimmed, and sometimes skinned. These fillets are wrapped 7-pounds to the package in vapor-proof waxed paper, placed on trays which are loaded into racks, and pushed into a quick freezer where they remain for 2 1/2 hours. Upon removal from the freezer, the packages are spray-galzed with water and packed 8 to a master carton. This carton is wire bound and immediately placed in storage in one of two insulated holds held at -10° F. Some species of fish are frozen whole and stored in 60-pound bags.

The Fairtry has a freezing capacity of 40 tons per 24 hours. There are 57,000 cubic feet of cold storage space aboard the vessel.

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 ABSTRACTER: Martin Heerdt

2.117 NEW PACIFIC TUNA CLIPPERS DESIGNED FOR STABILITY

Anonymous
National Fisherman 36, No. 3, 14-18 (April 1955)

The new tuna clippers Cabrillo and Dominator were designed for stability and to provide improved livability and comfort for the crews on long trips. The all-welded steel hulls have longitudinal framing similar to that used in large tankers. A watertight-bulkhead at the aft end of the galley on the main deck extends clear across the vessel; a watertight-door in this bulkhead leads to the engine room through a passage just to one side of the centerline of the vessel. This single passage eliminates two long side alleys with their relatively low freeboard and two wing doors into the engine room and results in increased stability.

Another feature of these vessels is the deep box keel which extends below the hull; this keel dampens rolling and helps with steering in following seas. The rudder was carefully designed to provide good steering in a following sea. It is considerably thicker and has a maximum thickness further aft than usual. The section near the trailing edge has a pronounced hollow.

The arrangements of the cabins and galley were carefully designed to give improved livability and comfort. The galley working space is separated from the mess table area by a serving bar. This arrangement provides adequate lockers drawers, and worktop areas and still allows a free flow of air across the entire galley area. A powerful blower provides a complete air change in the galley every minute.

The bait and brine wells under deck hold 291 fish tons and bait boxes above deck hold 50 fish tons. The vessels have capacities for 47,191 gallons of fuel oil, 1,600 gallons of lubrication oil, and 4,000

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 ABSTRACTER: D. T. Miyauchi

RADAR REFLECTOR BUOYS

FLOATING FACTORYSHIP

ALUMINIUM FISH HOLDS

CLIPPER DESIGNED FOR STABILITY

2.118

Offal from the filleting operations is conveyed to one of four hoppers located below the processing deck where it is held preparatory to being manufactured into fish meal. The offal is cooked in rotary, steam-jacketed concentrators for 8 to 10 hours. When dried, it is dropped to the deck below, ground, and bagged.

2.117

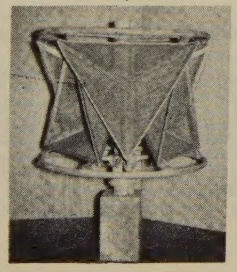
gallons of fresh water. A complete description of the engine room equipment is included.

2.116 (Cross References: 2.14, 1.86)

The reflector is of the corner type with six right-angled corners fashioned of stainless steel screen, each corner triangle being 18 inches to a side. The complete reflector weighs about 40 pounds, and offers very little wind resistance.

With radar antenna 65 feet high and reflector 12 feet high, the effective range varies from 6 to 8 miles depending upon weather conditions.

Reflector portion of a radar buoy used by "Deep Sea."



2.05 COOLING PRACTICES AND MICROCOCCI GROWTH

Miller, W. A. and Smull, Mary L. (Kansas Agricultural Experiment Station, Manhattan)
Journal of the American Dietetic Association 31, No. 5, 469-473 (May 1955)

Purpose. -- The purpose of the reported investigation was to demonstrate the dangers that accompany slow and inadequate cooling of cooked foods. It was also designed to correlate the rate and degree of cooling with multiplication of "food poisoning" micrococcus.

Gastroenteritis, caused by Staphylococcus organisms, is considered to be the most common type of bacterial food poisoning. It frequently follows the consumption of certain types of food prepared hours before serving and stored in relatively large quantities.

Procedure and Experimental Results. -- Experiment A. Cream pie filling was prepared by a standard method, cooled to 122° F. by stirring in a stream of cold air, dispensed into four 2-gallon crocks and each crock inoculated with approximately 25,000 cells per gram of a known food-poisoning strain of Micrococcus pyogenes aureus.

A thermometer was suspended in the center of the contents of each crock and the containers stored in the following ways: (a) in a sink containing 5 gallons tap water at initial temperature of 62.6° F. with water being changed hourly; (b) in an identical sink containing running water adjusted to remain approximately 4 inches deep with water temperature 62.6° F.; (c) in a 4-cubic foot home-style refrigerator at 41° F.; and (d) at room temperature, approximately 84° F.

Temperatures of the filling and the refrigerator were recorded hourly for 9 hours and at 22 to 24 hours. Plate counts were made on Chapman's mannitol-salt agar at 8 and 24 hours.

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 ABSTRACTER: Kathryn L. Osterhaug

2.115 SKIFFS USED FOR SHRIMP FISHING IN INSIDE WATERS OF GULF OF MEXICO

Denham, S. C. (Fish and Wildlife Service, New Orleans, Louisiana)
Commercial Fisheries Review 17, No. 3, 39-41 (March 1955)

During the last 2 years a new type skiff has been developed in the Gulf of Mexico area for shrimp fishing in inside waters. These skiffs are being used principally in the Lafitte-Barataria region of Louisiana. There are now 200 to 300 shrimp skiffs in this area. The new skiff is considered superior to the old type trawler used solely for inside shrimp fishing because of its manuverability, speed, and over-all efficiency, and economical operation (including manpower, maintenance, and repair needs).

The skiffs range in length from 20 to 26 feet, are 6 to 9 feet wide, and have a draft of from 18- to 24-inches. The hulls are nearly all constructed of cypress, are built with a flare and "V" bottom toward the bow, and have a keel for protection from the bottom as well as for added reinforcement. The shrimp skiffs are powered by 86- or 115-h.p. marine gasoline engines and have a fuel capacity of 30 to 60 gallons. They cruise at 18 to 22 m.p.h. with a top speed of about 30 m.p.h. At trawling, cruising, and top speeds they use about 3, 4, and 5 gallons of fuel per hour, respectively. These capabilities make it possible to utilize fishing grounds up to about 30 miles from port.

Thirty to 40-foot shrimp trawls are towed by these skiffs. The trawl is played out and hauled in by hand from the platform that extends out over the stern. When a haul is completed, the cod end is fastened to and held open by a frame extending out over the side amidships. The catch is then brailed into the sorting platform on the forward deck. The boat ends of the towing warps are secured to two uprights fastened to the gunwales just aft of amidships. The net is spread for drying on a "T" frame erected at the forward edge of the stern platform.

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 ABSTRACTER: M. R. Greenwood

2.15 TECHNIQUES OF FREEZING AND STORING FISH AND SEAFOOD. PART II

Butler, Charles (Fish and Wildlife Service, Washington, D. C.)
Frosted Food Field XX, No. 4, 20-22 (April 1955)

Part I of this article described the principle causative agents in the loss of quality of fishery products. Part II describes when and where these losses occur, and the methods for limiting these losses to a minimum.

The three main stages where quality loss may occur are (1) in fresh-iced storage and transport; (2) during freezing; and (3) in frozen storage.

The fresh-iced stage aboard ship is very important because the initial lag in enzymatic, bacterial, and oxidative changes can be prolonged or cut short, depending on the time and effectiveness of icing. When iced products are brought ashore there exists the danger of further bacterial contamination as well as the deleterious effects of higher temperatures.

During the process of freezing several changes occur. Bacterial action is slowed down and virtually stopped at 0° F. Enzymatic-protein deterioration is arrested but does not cease even at -10° F. to -20° F. Denaturation of the protein and the characteristic drip occur at this stage.

As frozen storage progresses the fish becomes tougher, develops off flavors and odors, and rancidity, dehydration and rusting develop.

Proper methods for icing fishery products. -- Icing must begin as soon as the fish are removed from the water. Small fish such as mackerel or herring, and fish taken in large quantities during

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 ABSTRACTER: Max Patashnik

2.118 TECHNIQUES OF FREEZING AND STORING FISH AND SEAFOOD. PART III

Butler, Charles (Fish and Wildlife Service, Washington, D. C.)
Frosted Food Field XX, No. 5, 12-14, 41 (May 1955)

Freezing and thawing. -- When brine-freezing fish in the round, the rate of freezing decreases as the depth already frozen increases. Flat fish freeze more rapidly than those which are round in cross-section.

Thawing fish in water at 60° F. takes about twice as long as freezing at 0° F. Again, thawing rates vary with the thickness of the fish.

Brine penetration studies. -- The problem of salt penetration in brine-frozen fish has been thoroughly studied at the Boston laboratory of the Fish and Wildlife Service. Their findings may be summarized as follows: (1) With methods used on the Delaware, salt penetration is not serious provided the fish are not held in the brine (23 percent NaCl) longer than 4 hours and the brine temperature does not exceed 10° F. (2) Fish left in the refrigerated brine after freezing continue to absorb salt. (3) Brine held at its freezing point, so that slush ice freezes out, results in some salt penetration of the fish. (4) Coating of the fish with a marine-plant gel is not recommended because, if use on a large scale, it would dilute and contaminate the brine.

Freezing fillets. -- At the present time large quantities of cod, haddock, ocean perch, flounder, rockfish, halibut, pollock, whitefish, and whiting are marketed as fillets. To maintain quality, bacteria should be kept to a minimum on any equipment used to transport or prepare fillets. This can be accomplished by frequent washing of all surfaces and thorough daily cleaning of the entire premises.

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 ABSTRACTER: Kathryn L. Osterhaug

PREVENTION OF FOOD POISONING

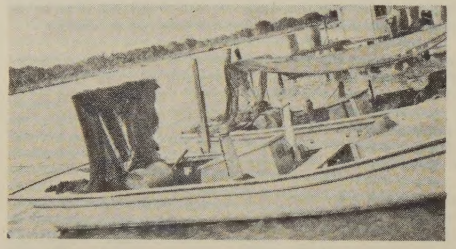
SHRIMP SKIFF FOR GULF FISHING

FREEZING AND STORING FISH

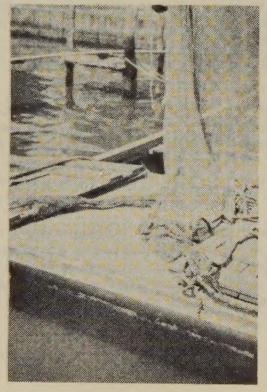
BRINE FREEZING FISH AND SHRIMP

2.115 (Cross References: 1.85, 2.1121, 2.14)

Usually only one man operates the boat and gear; but if prices and other conditions are favorable, two men, or a man and a boy, may be profitably employed on one boat. Regular commercial fishermen own most of the shrimp skiffs in the Lafitte-Barataria area, but casual and sport fishermen have also invested in this type of craft. In addition to shrimp trawling, this boat is well suited for crab fishing, hand-line fishing, and rapid transportation to and from fishing and hunting camps in the low marshland areas.



View showing entire shrimp skiff including (from bow to stern): sorting box on forward deck, bracket for attaching cod-end holding frame, uprights for boat ends of towing warps, engine covering, fuel tank, trawl net draped on "T" frame, and stern platform.



Stern view of a shrimp skiff showing a portion of the otter boards and shrimp trawl hanging on "T" upright.

2.05 (Cross Reference: 3.235)

For the first hours, the filling in the crock immersed in running water cooled the most quickly and after 9 hours had the lowest plate count. After this, the filling stored in the refrigerator cooled at the fastest rate and after 24 hours had a much lower plate count than any of the other batches. The comparative figures for all 4 batches can be seen in figure 1 and table 1.

Experiment D. The most rapid temperature decrease in unchilled potato salad (95° F.) was obtained when one-gallon quantities in two-gallon crocks, or similar amounts in 10 x 10 x 4-inch stainless steel inserts, were packed in chipped ice replenished hourly. Even under these conditions 3 to 4 hours were required to lower the temperature from a 95° - 104° F. range to 59° F. (15° C.) which is the approximate minimum growth temperature for Micrococcus pyogenes aureus.

TABLE 1

CONDITIONS OF INCUBATION	PLATE COUNT	
	9 hr. after inoculation	24 hr. after inoculation
	million/gm.	million/gm.
Storage in home-style refrigerator held at 5°C. (41°F.)	2.5	2.6
Crock held in running water, 17°C. (62.6°F.)	0.7	100.0
Crock held in standing water, changed hourly for 9 hr.	6.0	300.0
Holding at room temperature, 29.9°C. (84°F.)	78.0	700.0

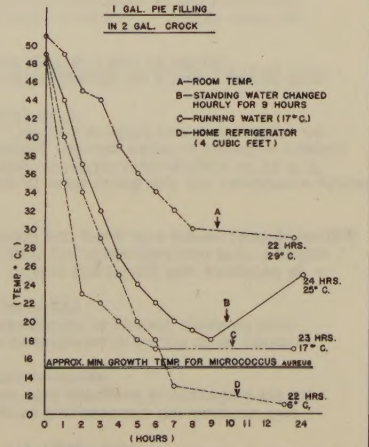

1 GAL. PIE FILLING
IN 2 GAL. CROCK
A—ROOM TEMP.
B—STANDING WATER CHANGED HOURLY FOR 9 HOURS
C—RUNNING WATER (17° C.)
D—HOME REFRIGERATOR (4 CUBIC FEET)
22 HRS. 29° C.
24 HRS. 25° C.
23 HRS. 17° C.
22 HRS. 6° C.
APPROX. MIN. GROWTH TEMP. FOR MICROCOCCUS AUREUS
(TEMP. ° C.)
(HOURS)

FIG. 1. *Cooling rates of 1 gal. lots of cream pie filling in 2-gal. crocks stored under four conditions. Center temperatures were recorded hourly for 9 hr., then at 22 and 24 hr.*

2.118 (Cross References: 3.234, 3.236, 1.85)

Proper packaging of fillets prior to freezing will give maximum protection to the product and help sell the product on the retail level. The important features in packaging to obtain the maximum protective effect include: (1) complete and intimate contact of product and carton to minimize contact of product with any entrapped air, lessening oxidative changes during frozen storage; (2) elimination of all voids in the package to prevent transfer of product moisture to package surface as frost or ice with temperature fluctuations in storage; and (3) absolute moisture-vapor proof seal of the package, including joints and creases, to prevent dessication in frozen storage.

Freezing shrimp. -- Limited tests have been made on freezing shrimp in salt brine. Recommendations based on these tests include: (1) use of only freshly caught firm whole or headed shrimp; (2) chilling of the thoroughly-washed shrimp in fresh ice water just prior to freezing; (3) maintenance of brine at 10° F. or below to minimize salt penetration; (4) removal of shrimp from brine within four hours after freezing; (5) rinsing of the frozen shrimp in fresh water (34° to 36° F.) and storage at 0° F.; (6) thawing in fresh running water at 60° F.; and (7) packing very carefully, with a moisture-vapor proof wrap, to minimize possible acceleration of dehydration effects by the salt present.

The Shrimp Association of the Americas has specified a quality shrimp product as: (1) clean, sound shrimp free from heads, walking legs, antenna, or foreign material and in which no odor of decomposition is evident; (2) that in which the natural color of the shrimp has not been changed; and (3) that having no blackened areas penetrating the shell or visible on the meats.

Breaded shrimp has become a substantial item in the past few years. Shrimp from frozen storage can be thawed and processed into breaded or precooked shrimp of good quality if: (1) the time between thawing and refreezing is kept at a minimum; (2) only quality raw shrimp properly wrapped, frozen and stored at -10° to -20° F. are used; (3) care is exercised to minimize bacterial recontamination during processing; and (4) the finished product is, in turn, properly wrapped, promptly refrozen, and stored at -10° to -20° F.

2.15 (Cross References: 3.230, 3.24)

relatively short fishing seasons, are usually iced in the round. Large fish such as salmon, halibut, cod, sablefish, haddock, and lingcod are usually dressed and packed in ice. Salmon taken a short distance from the cannery are iced in the round. During warm weather, the gills and viscera, which spoil rapidly, are removed but the head is left on to minimize dehydration and oxidation. Shrimp should be headed before icing.

Icing. -- Despite the well-recognized preservative qualities of ice, further improvement has been sought, such as the addition to ice of a bactericide, a bacteriostat, the use of a 3 percent NaCl brine ice, or the use of mechanical refrigeration in conjunction with ice. Some of the anti-bacterial additives used in ice are chloramines, benzoates, nitrites, and antibiotics. None of the chemicals tested has been sufficiently successful to capture a place in U. S. commercial fisheries.

A 3 percent NaCl ice (roughly equivalent to sea water) will maintain a 30° F. temperature. This is the temperature at which the first portion of water in fish flesh freezes, and will thus ideally chill, yet not freeze the fish. Mechanical refrigeration used to supplement ice preserves the ice by counteracting the heat leakage into the hold. The ice is thus more completely effective in reducing fish temperatures.

Fishery products taken at a considerable distance from the processing plant that cannot be preserved by icing are frozen at sea. The factoryship represents a type of operation where the fish are caught, processed into market form, packaged, and frozen at sea.

Brine immersion freezing. -- Experimental studies have been started recently by the Fish and Wildlife Service Technological laboratory in Boston to develop equipment and procedures for freezing fish in the round for subsequent processing ashore. Cod, haddock, and other species taken from the trawl are immersed and agitated in a NaCl brine at 5° F. until they are frozen. The frozen fish are stored in fish pens maintained at 0° F. to 10° F. by refrigerated coils while enroute to port.

Most of the research to date has been on haddock (principal specie taken in New England trawl fishery). Information from semicommercial tests may be applicable to other species and other areas.

3.19 GAMMA RAYS LENGTHEN REFRIGERATED LIFE OF FRESH FOODS

Brownell, L. E.; Kempe, L. L.; Graikoski, J. T.; and Dennis, R. C. (University of Michigan)
Refrigerating Engineering 63, No. 3, 42-47, 116, 118 (March 1955)

Preliminary studies have indicated that sterilizing doses of radiation produce undesirable flavor and odor change in foods, particularly meats and dairy products. Research is continuing in an effort to overcome these disadvantages.

Another approach to the use of radiation in food preservation was opened up when studies were made demonstrating that gamma rays equal to 1 to 2 percent of the sterilizing dose can be used to pasteurize foods for refrigerated storage. These doses can reduce the microorganism population 90 to 99+ percent without producing undesirable changes in the food. Gamma-ray pasteurization refers to a killing of microorganisms throughout a food item, not just on the exposed surfaces.

Potatoes and other produce. -- Radiation pasteurization has been found to be very successful in preventing sprouting and spoilage of potatoes kept in refrigerated storage. A limited amount of work has indicated that the refrigerated storage life of onions and of shredded cabbage for cole slaw can also be increased materially by radiation.

Meat. -- Ground pork irradiated at levels between 60,000 and 100,000 rep will keep for at least 8 days at 40° F. Experimental data indicate that irradiated freshly ground pork at the packing house might have an expected refrigerated storage life of about 2 weeks. In theory, standard cuts of pork are expected to have as long or longer refrigerator shelf life than the ground meat because of freedom from contamination by microorganisms below the surface.

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3.249 FREEZING AND COLD STORAGE OF PACIFIC NORTHWEST FISH AND SHELLFISH. PART IV. STORAGE CHARACTERISTICS OF FOUR SPECIES OF SALMONIDAE

Heerdt, M. and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle, Washington)
Commercial Fisheries Review 17, No. 3, 13-17 (March 1955)

Samples of steelhead trout (Salmo gairdnerii), pink salmon (Oncorhyncus gorbuscha), chum salmon (Oncorhyncus keta), and silver salmon (Oncorhyncus kisutch) steaks, wrapped in cellophane, (and the silver salmon steaks also wrapped in aluminum foil) were frozen and stored for 270 days at 6° to 16° F. After this length of time, the fish wrapped in cellophane had the following characteristics: (a) The steelhead trout steaks were slightly rancid after 90 days and remained slightly rancid for the rest of the storage period. (b) The pink salmon steaks were slightly rancid after 180 days and moderately rancid after 170 days. (c) The chum salmon and silver salmon steaks were slightly rancid after 180 days and remained slightly rancid for the rest of the storage period.

The silver salmon wrapped in aluminum foil were of considerably better quality after 270 days storage than those wrapped in cellophane. These aluminum foil-wrapped samples showed no evidence of rancidity at the end of the experiment.

A summary of the condition of the various steaks after several storage intervals is summarized in table 1.

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3.26 SAFEGUARDING THE QUALITY OF FROZEN FOODS IN SUPER MARKETS

Pollock, M. Crawford (C. A. Swanson and Sons)
Frosted Food Field XX, No. 5, 18 (May 1955)

If the frozen food industry is to realize the vast potential it possesses today, the coordinated efforts of processors, distributors, and retailers are necessary to improve frozen-food handling and storage techniques.

Although the majority of frozen food processors maintain strict quality control during every phase of production and storage, many violations of proper handling procedure are practiced after the frozen products leave the point of manufacture.

Rules for handling. -- Proper handling is the key not only to the profitable operation of the frozen food departments in retail stores, but is also the key to the future success of the entire frozen-food industry. The following rules constitute a basic outline which, if followed, should assure customers of high-quality frozen products:

1. Carefully check all merchandise on arrival. If any products appear to be thawed or damaged, the transportation company and packer's representative should be immediately notified.
2. Always rush deliveries to sub-zero storage; many handling problems originate when frozen foods are left on the dock or on the floor, or are placed in coolers rather than freezers.
3. Never allow frozen products to stand on the floor, or in the aisles awaiting pricing -- price the items and transfer them to the freezer cabinet quickly!
4. Stock all frozen products below the "safety line" indicated in frozen food cabinets -- packages stored above the plateline will defrost!

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3.26 INDEPENDENT SUPERMARKETS REPORT SPECIALTIES NOW 23 PERCENT OF FROZEN FOOD SALES

Anonymous
Quick Frozen Foods 17, No. 10, 61, 166 (May 1955)

According to a survey conducted by Quick Frozen Foods, independent supermarket operators expect to double their sales of cooked and prepared frozen foods during the next two years. Many of these foods are already turning over as fast or faster than the frozen staples.

A table showing the "Best Sellers in Independent Supermarkets" is included. As shown in the table, pot pies and fish sticks were the leading items.

A second table lists cooked and prepared frozen foods handled by independent retailers and the percentage of retailers listing the various items in the survey.

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GAMMA RAY PASTEURIZATION

MAINTAINING FROZEN-FOOD QUALITY

STORAGE LIFE OF FROZEN SALMON

MARKET FOR FROZEN SPECIALTIES

3.26

5. Never stock frozen foods in meat display cabinets where the temperature is above zero.
6. Rotate stocks in frozen-food cabinets -- current freezer stocks should be stocked above new merchandise.
7. Check the temperatures of freezer cabinets each morning and night -- be sure that these cabinet temperatures are sub-zero.
8. Observe manufacturers' instructions for handling individual products -- packages marked "This Side Up" and "Do Not Store on End" should be stocked in that manner only!
9. Examine frozen food cabinets regularly for neatness -- remove torn and crushed packages which chase cutomers away and damage your store's reputation. Attractive orderly arrangement of stocks will pay big dividends.
10. Provide maximum selection for your customers -- maintain well-stocked frozen food cabinets at all times.

Consumer education. -- The most careful precautions throughout the chain of distribution are nullified by the consumer who fails to comply with the directions on the package. The food processor must explicitly stipulate on the package how the product should be stored, prepared and served. The following points constitute a check list for consumers when purchasing frozen foods:

1. Make sure the frozen products you buy are frozen solid.
2. Do not store frozen foods merely on the shelves of the refrigerator -- they should be stored in a home freezer or in the freezing compartment of your refrigerator.
3. Never refreeze frozen foods which have defrosted -- either use such foods immediately or dispose of them.
4. Follow the manufacturer's instructions precisely relating to preparation of the product. Do not reduce the amount of heating or cooking time stipulated on the package.

3.26

BEST SELLERS IN INDEPENDENT SUPERMARKETS

Operators of independent supermarkets listed their five best sellers in order of importance. Percentages of retailers listing the various items follows:

	% 1st	% 2nd	% 3rd	% 4th	% 5th
Pot Pies	48.3	38.0	19.8	7.7	---
Fish Sticks	17.8	20.0	21.3	7.7	6.6
Dinners	8.8	4.0	17.0	12.9	20.0
Fruit Pies	7.0	6.0	10.6	17.8	10.0
Precooked Seafood*	5.4	6.0	4.3	18.8	20.0
Breaded Shrimp	5.4	2.0	6.4	10.3	3.3
French Fries	3.6	6.0	4.3	10.3	13.3
Soups	1.8	8.0	6.4	18.0	
Chinese Foods		2.0	2.1	2.6	---
Waffles		2.0			---
Mexican Dinners		2.0			---
Ravioli		2.0			---
Meat Specialties		---	2.1		6.6
Seafood Dinners		---	2.1		---
Breaded Oysters			---	5.1	---
Breaded Scallops			---	2.6	---
Italian Foods		---	---	2.6	---
Tamales		---	---	2.6	---
Spanish Foods			---	---	3.3
Desserts		---	---	---	3.3

*Some respondents combined all precooked seafoods while others, as shown below, listed specific items.

HANDLED BY RETAILERS

Cooked and prepared frozen foods handled by independent retailers and the percentages of retailers listing the various items follow:

Fish Sticks	98%
Pot Pies	95%
French Fries	95%
Soups	83%
Precooked Seafoods	80%
Fruit Pies*	78%
Baked Goods*	41%
Chinese Foods	32%
Italian Foods	24%

Also listed were tuna pies, ham sticks, Spanish foods and onion rings.

*Some respondents listed fruit pies while others listed baked goods, probably including fruit pies.

3.19

Discussion. -- Many problems remain to be solved before it will be possible to pasteurize prepackaged meat on a commercial basis with gamma radiations. Probably the chief problem is the establishment of the wholesomeness of irradiated food. Michigan Memorial Phoenix Project Number 41 has supported animal feeding experiments using irradiated feed for about a year. All evidence collected to date indicates that these foods should be considered wholesome. However, in order to establish this fact on a reliable basis, long-term feeding studies, with significant numbers of animals, must be completed.

Other problems which exist include color and flavor changes caused by the irradiation of various cuts and types of meat, fish, and shellfish.

3.249 (Cross References: 1.3, 4.5)

Table 1 - Effect of Time in Frozen Storage and Method of Packaging on the Quality of Steaks from Four Species of Salmonidae

Time in Frozen Storage at 6° to 16° F.	Quality Rating 1/								
	Steelhead Trout		Pink Salmon		Chum Salmon		Silver Salmon		
	Cellophane	Tin	Cellophane	Tin	Cellophane	Tin	Cellophane	Foil	Tin
Days									
0	VG	VG	VG	VG	G	G	VG	VG	VG
90	F	G	G	VG	G	G	G	G	VG
180	F	G	F	G	F	G	F	G	VG
270	F	G	P	G	F	G	F	G	VG

1/ VG = Very good (highest quality)
G = Good (some loss of original quality but no indication of rancidity)
F = Fair (slightly rancid)
P = Poor (moderately rancid and barely edible)
U = Unacceptable (very rancid)

3.5 PREPARING FISH CAKES

Anonymous
Food Engineering 27, No. 3, 187 (March 1955)

Fried fish cakes can be made from salt codfish. To begin, 12 1/2-pounds of salt codfish is shredded and soaked for 3 hours in cold water. The fish is then removed from the water, reshredded, and placed into a steam-jacketed kettle that contains fresh water. The contents of the kettle are brought to a boil, and the water is drained off and discarded.

Twenty-two pounds of peeled potatoes and a quantity of fresh water is now added to the kettle, and the mixture is boiled until the potatoes are well done. The cooking water is again drained off and discarded, and the fish and potato mixture is ground through a plate having 1/4-inch diameter holes.

Twenty pounds of beaten eggs, 1 1/2-pounds of butter or margarine, 2 1/2-pounds of diced onions, and 3/4-ounce of pepper are then combined with the fish and potato mixture. This combination of ingredients is blended thoroughly in a vertical-type bowl mixer. Cakes are formed from the blended ingredients, and these are dipped into beaten eggs, rolled in bread crumbs, fried to a light brown color, packaged, and held for sale in a refrigerated display case.

3.238 ACETOGLYCERIDES ON WAY

Anonymous
Chemical and Engineering News 33, No. 13, 1298 (March 28, 1955)

Acetoglycerides, which are relatively simple to produce, have shown considerable promise for use as edible coatings. These products are presently selling at 70 cents a pound for cosmetic and industrial uses. Several thousand pounds of samples have already been given to industry.

Mixed glycerides of acetic acid and other fatty acids have been known since 1912, but their potential uses did not become apparent until recently. The U. S. Department of Agriculture's Southern Utilization Research Branch studied monoglyceride derivatives for the first time during 1951.

Acetoglycerides are true fats. They can be made as clear liquids or as sharp-melting point solids. The solids are nongreasy and flexible. Most of them may be elongated 200 percent at room temperature before fracturing. By comparison, paraffin will fracture after 5 percent elongation.

The Department of Agriculture produced acetostearin by the reaction of monostearin with acetic anhydride in glass or stainless steel vessels. This reaction requires about one hour at 230° F. On completion of the reaction, the reaction products are washed with water which is decanted off after the batch has settled. The washed product may then be dried by bubbling an inert gas through it while it is being heated in a partial vacuum. Carefully made, purified and distilled acetostearins have practically no taste, odor, or color.

Solid acetoglycerides may be used to produce a flexible, non-glossy, skin-type coating on meats. This coating is applied by dipping the meat in a bath of acetoglycerides held at 230° F. The meats are

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3.8 WHITE SPECKS ON VINEGAR-CURED HERRING

Truscott, Beryl and Hoogland, P. L. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Fisheries Research Board of Canda, Progress Reports of the Atlantic Coast Stations No. 61, 12-13 (March 1955)

The appearance of hard white specks on the surface of vinegar-cured herring is a fairly common occurrence. Occasionally, the specks become larger than pinhead size so that the herring is unmarketable. At least 95 percent of the material that forms the white specks was found to be the amino acid l-tyrosine. This tyrosine was made available by the breakdown of flesh proteins during the period of curing and subsequent storage. Tyrosine is quite insoluble in water and even less soluble in the vinegar-salt brine used for curing.

One theory for the formation of the tyrosine specks is as follows: During the curing process, herring proteins are broken down and amino acids, including tyrosine, are liberated. Tyrosine, however, cannot remain in solution and precipitates out of solution onto the herring. As more tyrosine is liberated, it rapidly collects around the previous centers of precipitation to form white pellets. If conditions are favorable for tyrosine liberation, the number of specks may increase to many hundreds on each fish. These conditions, however, are very unusual.

The authors examined the method for making vinegar-cured herring and arrived at the following conclusions: After the fresh herring have been eviscerated, washed, and brushed, a small amount of the viscera remains in the headless and dressed herring. This viscera contains enzymes that accelerate protein breakdown. During the curing process these enzymes leach out of the herring, dissolve in the vinegar-salt brine, and remain when the herring are taken out. If subsequent batches of herring are treated with the same brine, the process reoccurs and more enzymes accumulate in the brine so

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3.236 AUTOMATIC REMOTE HEATING CURES FRYING FAULTS

Smith, Horace L. and Freeman, William E. (H. W. Lay and Company, Atlanta, Georgia)
Food Engineering 27, No. 3, 60-62, 205 (March 1955)

Greater efficiency in potato chip production has been obtained by means of a radically different method of heating the frying oil. Instead of applying direct heat to raise the temperature of the frying oil, the oil is heated at a relatively low temperature by circulating it from the fryer through a heat exchanger and back into the fryer continuously under instrument controls. The low-temperature liquid medium that heats the oil in the heat exchanger is, in turn, heated by circulation through the tubes of a gas-fired furnace. The complete process is shown in the diagram on this card.

Indirect heating of the frying oil eliminates overheating or heat breakdown of the frying oil because the temperature of the heat exchange surface with which the oil comes in contact never exceeds 450° F. Products fried in this oil are of better quality than products fried in oils that have been subjected to higher heating temperatures. Automatic temperature controls regulate the amount of heat needed and transferred to the frying oil so that it is maintained within 2° F. of the selected frying temperature.

The indirect method of heating the oil (1) eliminates the fire hazard at the continuous fryer, (2) increases the fuel utilization efficiency from the 35 or 40 percent obtained with direct heated fryers to 60 percent efficiency, (3) makes it possible to operate two or more fryers at different temperatures, (4) reduces burning of food particles, oil discoloration, and shut-down time for cleaning, and (5) increases the throughput of the fryer by about 50 percent.

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FRIED FISH CAKES

WHITE SPECKS ON PICKLED HERRING

PLASTIC DIP FOR PACKAGING

INDIRECT HEATING OF FRYING OILS

3.8 (Cross References: 3.5, 1.2)

that reused brine causes more breakdown of proteins than a fresh brine. In the 8 to 10 days that the dressed fish are held in this brine, more tyrosine than usual will be liberated. If these herring are barreled and stored, protein breakdown continues because the pickle solution adhering to the herring when it was placed in the barrels contained enzymes. During storage, still more tyrosine is liberated and in time the point is reached where tyrosine precipitates in the form of white specks on the herring.

At present, this explanation is based on indirect evidence, but to avoid trouble the following recommendations have been prepared: (1) Dress the herring carefully to completely remove all the viscera. (2) Use fresh 80 to 90 percent saturated salt brine containing the vinegar equivalent of 3 to 4 percent acetic acid for each batch of fish. (3) Clean the pickle tanks thoroughly between batches. (4) Cure herring fillets the first time and fillets or headless and dressed herring the second time if the brine has to be used twice. (5) Let the herring drain well before repacking into barrels and add only fresh brine to these fish. Keep storage time to a minimum and store at 40° to 45° F.

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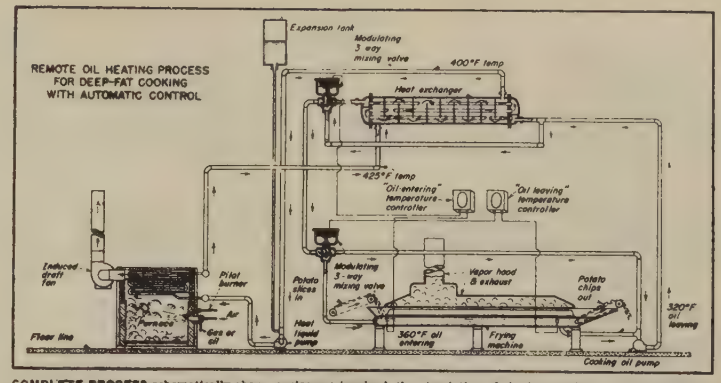

COMPLETE PROCESS schematically shows equipment involved, the circulation of the heat-exchange medium through the furnace and heat exchanger, and the path of the cooking oil through the exchanger and fryer. Automatic control valves and oil-flow bypasses on fryer and exchanger maintain oil temperature within 2 deg. of selected point regardless of big heat-load variations. Two or more fryers can be served by such a system.

3.5 (Cross Reference: 1.5)

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dipped for 3 to 15 seconds depending upon their size and shape and the thickness of coating desired. This coating is white when it first solidifies, but within a few minutes it becomes transparent and glossy. Acetostearin was used at the rate of 13 pounds per 1,000 pounds of meat for coating wieners (see illustration below). This quantity produced a 0.0025-inch coating on the wieners which when held in 39° F. storage for 9 days lost only 2-percent moisture. By comparison uncoated wieners lost 39-percent moisture during a same period of time in 39° F. storage, Molds will not grow on meats beneath an unbroken coating of acetoglycerides and the development of rancidity in the meat is also strongly inhibited. The acetoglyceride coating itself resists the development of rancidity.

Liquid acetoglycerides are good solvents for certain pharmaceuticals and cosmetic ingredients. They are poor solvents for hardened fats. They also have good plasticizing properties with cellulose esters and vinyl resins.

Wieners can be dipped in molten acetoglyceride bath at about 250° F. to give glossy transparent coating. Mold spores will not grow beneath coating, which inhibits moisture loss and rancidity.

3.231 FROST-HEAVE IN COLD STORES

Pitts, G. Yate
Modern Refrigeration 58, No. 685, 130 (April 1955)

The causes, prevention, and cure of frost-heave were the subject of a paper entitled "Sub-soil temperatures and frost-heave" by Mr. G. Yate Pitts. Ground temperatures do influence frost-heave. Increased floor insulation as a means of combating frost-heave is likely to be expensive and inconvenient. Frost-heave is influenced to a considerable degree by the nature of the soil

If a weighed sample of the soil taken while still frozen from beneath a frost-heaved building was dried to constant weight in an oven, the loss of weight invariably showed that there was an excess of water over and above that which could be held by the voids in the soil. When saturated, a cubic foot of soil may contain 0.30 cubic feet of water. When entirely converted into ice this water expands 9 percent in volume. This small increase in volume is only a minor portion of the frost-heave observed and would be unnoticeable of itself. Excess water is sometimes found in lens formation, that is a thin layer of ice at one, or more often, several levels under the cold store. Lens formation is thickest at the center of the cold store chamber and disappears 5 or 6 feet from the outer walls. Under continuous winter conditions the lenses would extend over the entire area. The intervention of summer, however, and the lateral heat flow in the sub-soil prevents this condition.

Samples of soil taken by the author from different locations have shown an excess water content of 33.5 to 60 percent by volume. The cause of this buildup in water content is due to the high capillarity of certain types of soil. Sand and gravel soils with good draining quality seldom are involved in frost-heave.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 9 PAGE 13
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerdt

3.231 PLATE MACHINE CUTS FOOD FREEZING TIME

Anonymous
Refrigerating Engineering 63, No. 4, 73 (April 1955)
Food Engineering 27, No. 4, 111 (April 1955)
Food Processing 16, No. 4, 82 (April 1955)

A new, automatic, straight line, continuous plate-freezer and caser has been developed and built by a Philadelphia firm. This machine which is now in use at a Salisbury, Maryland plant freezes 9,000 standard size retail packages per hour and holds a total of 14,000 of these packages. A 1 3/8-inch thick package can be frozen in 90 minutes in this machine, whereas a similar package cannot be frozen in less than 180 to 240 minutes (plus additional handling time) in a conventional air blast freezer. The new freezer is reported to be the first machine ever developed to continuously freeze and case the entire output of a high speed wrapping machine.

The freezing section, which is about 10-feet high, 15-feet wide, and 25-feet long, is enclosed in a special room that is 12-feet high, 20-feet wide, and 30-feet long. Eight freezing levels are provided, each consisting of a lower and an upper plate distinct and separate from all others. Each level provides 4,000 square feet of refrigerated surface in contact with the packages and 4,000 square feet of refrigerated surface not in contact with the packages. Plate surface temperature approximates the refrigerant temperature because prime surface plates are used. Defrosting is only a minor problem with the new plate freezer because the packages enter through flap type ports which reduce infiltration of moisture and help prevent frost formation on the off-contact side of the plates. The continuous movement of the packages over the contact surfaces of the plates keeps them relatively free from frost.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 9 PAGE 13
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt

3.26 MARKET TESTS INDICATE WHETHER OR NOT A NEW FROZEN PRODUCT WILL BE PROFITABLE

Mentley, George (National Association Frozen Food Packers)
Quick Frozen Foods 17, No. 10, 63 (May 1955)

New cooked and prepared frozen-food products are appearing on the market in rapid succession. The packers of these new products should keep in mind a few basic requirements that need to be met before the distribution of a new product is set up.

Pretest new products. -- Pretesting should include both panel taste-testing and introduction into one or more test markets for a long enough period to produce reliable sales figures. Market tests give an indication of the product's sales appeal and degree of acceptance.

Product promotion. -- After a new product reaches the retailer's cabinet it should be sold on a basis of consumer education rather than strictly on a price basis. It is the responsibility of a packer of a good and proven product to promote that product rather than leaving it up to the retailer.

With today's strong reliance on impulse buying, the consumer must be preconditioned to accept a product when she sees it in the cabinet of a self-service store.

Merchandising. -- An important technique for boosting sales at the retail level is the use of related items sales. It has been demonstrated that natural combinations such as fish sticks and french-fried potatoes can increase volume when promoted to the public.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 9 PAGE 13
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Kathryn L. Osterhaug

3.237 FISH STICK PROCESSING PROBLEMS

Wolfe, Leonard P.
Frosted Food Field XX, No. 4, 19, 47 (April 1955)

Fish sticks have shown phenomenal growth lately. They have become a part of our daily diet.

The early hand and batch method of processing fish sticks has been superseded by continuous, machine production procedures involving close quality control of (1) moisture, (2) fish quality, (3) weight and size of stick, (4) viscosity of batter mix, (5) dryness of breading, (6) cleanliness of oil, (7) constant temperature of frying oil, (8) proper frying time, and other factors not originally considered.

Cod and haddock are the most frequently used fish for sticks.

Early practice required the frozen blocks of fish fillets to be glazed in order to prevent dehydration. Today, this same objective is accomplished by proper packaging.

Cutting blocks into sticks of the correct size is still a problem. The meat-saw method of cutting sticks is considered the best procedure to date, despite the loss in fish sawdust.

The battering and breading operation has become completely mechanized. This has resulted in a smoother and more uniform coating than was possible in the former hand operation.

Shallow continuous cookers are replacing the deep batch fryers, some handle up to 2,000 pounds per hour.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 9 PAGE 13
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Max Patashnik

FROST-HEAVE IN COLD STORES

MARKETING FROZEN PRODUCTS

AUTOMATIC PLATE FREEZER AND CASER

FISH-STICK PROCESSING

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Continued effort on improving quality, increasing convenience, building consumer value, and using more planned consumer promotion will keep the industry growing indefinitely.

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Initially fish sticks were cooked for 1 1/2 to 2 minutes or longer at 375° F. Now, cooking times range from 50 to 60 seconds and temperatures from 385° to 400° F. Factors involved in this change were (1) firmness of stick, (2) less wrinkling, (3) increase in production, and (4) minimum weight loss.

Vegetable oils and hydrogenated fats are used, depending on the individual processors preference. A pick-up of 6 to 8 percent oil by the fish sticks is considered normal. To produce a quality product, the cooking oil must be regularly cleared of sediment and other impurities.

The batter-mix and breading is considered vital. The batter should help seal in flavor and retain the natural juices, and should have an accurately controlled breading pick-up. The breading should have a low oil pick-up, should turn the proper color at the time and temperature cooked, and should become crisp when the housewife oven heats the fish sticks.

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With continued heat extraction the temperature plane of 32° F. descends into the subsoil. On encountering moisture, a film of ice forms and the expansion in volume causes a minute upward thrust. The expansion of moisture particles on freezing takes place in an upward direction or the direction of heat extraction. Growth of the ice crystals occurs due to the attraction of interstital moisture which may be supplied as a liquid in contact with the ice film or as vapor condensing upon it.

There are two methods of preventing frost-heave by means of electrical heater mats. Method 1 utilizes a 30-volt circuit of uninsulated wire embedded in concrete. A transformer is ordinarily used to reduce the single phase line supply to 30 volts. Method 2 utilizes circuits at line voltage and is made possible by the use of a new type of metallic sheathing and mineral insulation for the cable.

The heat output of the electrical mat must exceed the rate of heat extraction in order to have a margin of safety, but the rate of input must not be more than twice the rate of heat extraction. Rapid reheating is not recommended because the same quantity of heat is required regardless of whether it is supplied in a short burst or over a longer period of time. Calculations of the heat input required should allow for voltage drops in the supply. Even a 10-percent voltage drop should not be ignored. About 0.35 watts per square foot supplied continuously or 0.6 watts per square foot supplied 45 percent of the time to a heater mat should prevent frost-heave. An indicating thermometer incorporated with an automatic switch for use in turning the heater mats on and off is essential for the control of the amount of heat to be added.

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The new freezer operates in the following way: The retail packages leave the wrapping machine via a belt and enter an accumulator. Each group of eight packages that accumulates trips a mechanism that ejects them individually onto one of eight pitched belts leading to separate levels of a loading chariot. When 35 packages have gathered on each of the eight belt levels, the plates open up and the 280 packages are pushed into the freezer by a hydraulic chariot. At the same time an equal number of frozen packages are ejected from the discharge end of the freezer. These eight lanes of frozen packages converge into four lanes that enter a four-level automatic caser. The top plates of the freezer are stationary, whereas the bottom plates are attached to a common frame that is supported by four wheels operating on cam tracks. It is the forward movement of the wheels that opens the plates.

4.91 THE NUTRITIONAL SIGNIFICANCE OF ESSENTIAL FATTY ACIDS

Holman, Ralph T. (Hormel Institute, University of Minnesota)
Food and Nutrition News 26, No. 7, 1, 4 (April 1955)

Complete exclusion of fat from the diet of rats causes a deficiency disease characterized by the cessation of growth, roughness of hair coat, scaliness of feet and tail, occasional bloody urine, and cessation of reproductive ability. Linoleic acid alone added to the diet either prevents or cures this deficiency disease. Other fatty acids added to the diet will also either partly or completely relieve the deficiency symptoms. This group of fatty acids is now called the essential fatty acids. Rats, mice, guinea pigs, swine, calves, dogs, chickens, human beings, and even insects, require these essential fatty acids.

Functions. -- The author has shown that linoleic acid, the most common dietary essential fatty acid, and linolenic acid are converted by the animal body mainly into arachidonic acid (4 double bonds) and hexaenoic acid (6 double bonds), respectively, for incorporation into tissue structural elements. These conversions are influenced by the vitamin pyridoxine. Animals must receive the essential fatty acids because they cannot synthesize them. They can, however, synthesize large amounts of saturated acids and oleic acid. Linoleic and arachidonic acids cure skin symptoms and restore growth in fat deficient rats, whereas linolenic and hexaenoic acids restore growth only.

Of all of the lipids analyzed in the author's laboratory, those of the reproductive organs had the largest proportions of the very highly unsaturated fatty acids. Faulty reproduction may be due to a vitamin E deficiency. Vitamin E also is a powerful antioxidant that inhibits the autoxidation of the highly unsaturated acids. Highly unsaturated acids have been found to initiate changes in sea urchin eggs comparable to that of fertilization. It appears therefore that the highly unsaturated fatty acids may be involved in reproduction and tissue growth.

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 ABSTRACTER: Martin Heerdt

4.12 PAPER CHROMATOGRAPHY OF UNSATURATED FATTY ACID ESTERS AS THEIR MERCURIC ACETATE ADDITION COMPOUNDS

Inouye, Yoshiyuki; Noda, Manjiro; and Hirayama, Osamu (Kyoto University, Kyoto, Japan)
Journal of the American Oil Chemists' Society 32, No. 3, 132-135 (March 1955)

The separation by reversed-phase paper chromatography of the methyl esters of unsaturated fatty acids as their mercuric acetate addition compounds is described.

The mercuric acetate addition compounds of 19 unsaturated fatty acid esters were prepared.

The paper chromatographs were made by immersing strips of filter paper in either tetralin or high-boiling petroleum hydrocarbon, removing, and pressing out excess solvent. The solvent remaining on the paper served as the stationary phase during chromatography. The paper was then spotted with 0.5 to 3 μl. of mercuric acetate addition compound dissolved in benzene or ether. The chromatograms were developed by descending technique with one of the following three solvent systems: methanol-acetic acid-tetralin, methanol-acetic acid- petroleum hydrocarbon, or diethylene glycol-acetic acid-tetralin. When development was complete, the paper was removed, dried overnight at room temperature, or at 80° C. for 30 minutes and sprayed with a 0.2 percent solution of diphenylcarbazone in alcohol. The mercuric acetate addition compounds were revealed after spraying as purple or bluish-purple spots. The R_F values of the mercuric acetate addition compounds prepared from pure fatty acid-methyl esters are given.

The method was applied to the mercuric acetate addition compounds prepared from the unsaturated components of olive oil, soybean oil, linseed oil, and cow-milk fat. A number of the individual unsaturated components present in the samples were identified by their respective R_F values.

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 ABSTRACTER: W. N. Sumerwell

4.29 IODIZED LIVER OIL OF THE BASKING SHARK AS A RADIOGRAPHIC CONTRAST MEDIUM

Skellon, H. J. and Spence, J. W. (Acton Technical College, London, England)
Chemistry and Industry, No. 14, 383 (April 2, 1955)

The iodized unsaponifiable fraction of liver oil obtained from basking sharks caught in Hebridean waters was found to have good radiographic properties. This fraction, which represents about 50 percent of the oil, is composed largely of the unsaturated hydrocarbon squalene. Even in the crude state, basking shark-liver oil, with its disadvantages of taste and smell, has radiographic possibilities for selected industrial or veterinary applications.

The procedure used to prepare an iodized liver oil was as follows: The crude liver oil was steam-distilled for 1 hour under reduced pressure and then dissolved in 40° to 60° C. boiling point light petroleum. The water that separated from the oil-solvent solution was removed. Activated charcoal was added to the oil-solvent solution. This solution was then boiled for 10 minutes to drive off the solvent, and the oil that remained was filtered. This oil was pale yellow in color, had very little taste or smell, and had an iodine value of 151.

To prepare the iodized liver oil, 20 grams of the distilled oil was dissolved in 600 milliliters of one in 20 (weight per volume) of iodine in carbon tetrachloride. The resulting solution was stirred mechanically for 2 hours at room temperature in a dark room. Nitrogen was bubbled through the solution continuously throughout the 2 hours it was being stirred. The solution was then held for 12 hours in the dark. Because the combined iodine volatilizes along with the vapor of the solvent at atmospheric pressure, the solvent was removed under reduced pressure. The greenish-brown oil that remained was washed three times with sodium thiosulphate (0.1 normal, 30 ml.) and then with similar

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 ABSTRACTER: Martin Heerdt

4.14 THE CHEMICAL CONSTITUTION OF SOME MARINE ANIMAL FATS

Meara, M. L.
Chemistry and Industry, No. 10, 246-247 (March 5, 1955)

The depot fats of most land animals are composed mainly of fatty acids of the C_{16} and C_{18} series. Palmitic acid is the most common saturated fatty acid except in ruminants where stearic acid predominates. Oleic acid is the most common unsaturated fatty acid among the C_{18} unsaturated series which is predominate in land animals.

The depot fats of aquatic animals contain a greater range of fatty acids that are more complex than the fatty acids found in the fats of land animals. Only 12 to 20 percent of the fatty acids present in aquatic animals is saturated and this fraction consists largely of palmitic acid. Fats from fresh water species contain large amounts of highly unsaturated C_{16}, C_{18}, and C_{20} acids, whereas fats from marine species contain small amounts of C_{16} acids and relatively large amounts of highly unsaturated C_{18}, C_{20}, and C_{22} acids.

Aquatic animals appear to obtain the bulk of their fat by ingestion. An example of this is found in the blubber fat of fat whales which is more unsaturated than that of lean whales, probably because of the highly unsaturated fat present in the krill on which the whales feed.

Another interesting feature of the depot fats of whales and seals is the large variation in the composition of their blubbers. Whale-blubber fat has more saturated fatty acids in the outer layers than in the inner layers. In the gray seal the saturated fatty acid content of the blubber decreases from 25 percent to 21 percent as the age of the seal increases from birth to the end of the suckling period. These decreases are balanced by an increase in the unsaturated C_{20} and C_{22} fatty-acid

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 ABSTRACTER: Martin Heerdt

FATTY ACID NUTRITION

RADIOGRAPHIC USE FOR SHARK LIVER OIL

CHROMATOGRAPHY OF FATTY ACID ESTERS

COMPOSITION OF MARINE ANIMAL FATS

4.29 (Cross Reference: 4.89)

quantities of water. A slight onion-garlic odor remained in the oil.

This oil met the accepted limits for free iodine in iodized oil as shown in the British Pharmacopoeia (1953), and was stable at 37° C. in contact with (1) water, (2) 0.9 percent sodium-chloride solution, and (3) 1.5 percent pepsin, 0.3 percent hydrogen chloride, and 0.5 percent sodium chloride solution. Assay by the official British Pharmacopoeia method showed an iodine content of 20 percent. This oil showed similar radiologic properties, and mobilities in capillary tubing when compared with a commercial product derived from vegetable oil and having the same percentage of combined iodine.

4.14

content of the blubber fat. When the gray seal goes to sea and feeds on the natural marine diet, the saturated fatty-acid content of its blubber decreases further and the C_{20} and C_{22} unsaturated fatty-acid content again increases. The C_{18} unsaturated fatty acids, however, remain relatively constant.

In common seals the saturated fatty-acid content of the blubber remains practically constant whereas the C_{18} unsaturated (mostly palmitoleic) fatty-acid content decreases from 49 percent at birth to 19 percent at the adult stage during which time the C_{18}, C_{20}, and C_{22} unsaturated fatty acids increase regularly. These variations are in part, at least, due to the influence of the diet.

Some marine animals deposit very unusual fats. For example, the sperm whale deposits wax in its head cavities and in its blubber, the dolphin and porpoise deposit isovaleric acid containing glycerides in their head and jaw oils, and some sharks deposit glyceryl ethers and/or squalene in their liver lipids.

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Sources. -- All natural fats and oils contain one or more members of the essential fatty acid group. Only linoleic and linolenic acids (2 and 3 double bonds, respectively) are found in vegetable oils. All of the highly unsaturated acids (2 to 6 double bonds per molecule) have been found in animal fats. The amounts of each of the acids present in 10 different vegetable and animal fats are shown in tabular form below. In some cases of infant eczema, animal fats appear to exert a curative effect not attributable to linoleic acid alone. These may be cases of genetic inability to synthesize arachidonic acid from linoleic acid. The human requirement for essential fatty acids is about 1 percent of the calorific value of the diet, and this need in the ordinary individual can usually be met by eating a balanced diet.

Rancidity. -- The essential fatty acids are the main substances in fats that are subject to rancidity. This is due to the high susceptibility of the methylene groups between the double bonds of these acids to oxidative attack. As fats become rancid, the essential fatty acids are oxidized to unstable peroxides. These decompose to yield smaller molecules having strong odors and flavors. The peroxides and their decomposition products no longer retain the value of essential fatty acids. The process of rancidification also destroys vitamin A, carotene, and tocopherol (vitamin E). The products of rancidity may also react and destroy water-soluble vitamins present in foods during storage and within the alimentary canal of animals. This process increases the requirements for these essential nutrients.

APPROXIMATE CONTENT OF HIGHLY UNSATURATED ACIDS IN VARIOUS FATS (% OF TOTAL FAT)

	Linoleic acid	Linolenic acid	Arachidonic acid	Pentaenoic acid	Hexaenoic acid
Olive oil	6				
Corn oil	42				
Soybean oil	52	2.3			
Lard	12	+	0.4	+	+
Beef tallow	3	+	+	+	+
Hog kidney fat	+	+	4.0	0.9	0.1
Hog liver fat	+	+	4.6	1.9	1.0
Hog ovaries fat	+	+	11.1	2.4	0.4
Hog testes fat	+	+	8.8	2.6	1.5
Lamb testes fat	+	+	10.3	0.3	15.6

+ = present, but not measured.

4.12

Data on the absorption spectra of the diphenylcarbazone complexes of the mercuric acetate addition compounds is presented. It is suggested that spectrophotometric measurement be used to adapt the paper chromatography procedure for quantitative use.

6.19 RECENT PROGRESS ON UNIDENTIFIED GROWTH FACTORS IN DISTILLERS DRIED SOLUBLES AND OTHER FEED SUPPLEMENTS

Norris, L. C. (Cornell University)
Proceedings of the Distillers Feed Conference, Cincinnati, Ohio, 39 (March 1955)

Evidence has been obtained which shows that the normal or maximum growth response obtained in chicks fed a purified diet supplemented with a mixture of sources of unidentified factors is due both to an organic factor or factors and to, in all probability, an unidentified mineral element or elements present in the ash of the mixture. Although seemingly remote, the possibility exists, however, that the growth response ascribed to an unidentified mineral element in the ash is caused by an organic or mineral-organic compound highly resistant to destruction at 525° C.

In this work, increasing the quantities of essential amino acids, doubling the quantities of known vitamins, and providing increased amounts of trace elements, including flourine and molybdenum, failed to increase the rate of growth. No effect also was obtained by increasing the quantities of potassium, sodium, magnesium and chlorine in the diet, or by reducing slightly the amounts of calcium and phosphorus.

Reprinted in part

6.190 THE NUTRITIVE VALUE OF FISH PROTEINS

Miller, D. S.
Chemistry and Industry, No. 18, 501 (April 30, 1955)

Very few nitrogen balance experiments have been carried out with fish meals that are used as food for animals and as food to supplement the diets of native populations.

A selection of commercial fish meals from various sources was found to have a Net Protein Utilization (N.P.U.) (the product of the biological value and the digestibility) of 60 as compared with an N.P.U. of 80 for fresh fish. Maillard type damage appeared to be responsible for this difference in protein utilization value. Extracted fish proteins that had been carefully dried were unaffected by heat in the absence of water if the temperature was kept below 50° C. Storage at room temperature for as much as 3 months likewise did not affect the nutritive value.

Methionine rather than lysine was found to be the limiting amino acid in the damaged meals, therefore it should be practical to add a small amount of methionine to commercial meals to raise their nutritive value. Anti-Maillard reagents also might be practical as a means of preventing the occurrence of protein damage.

A. E. Bender, in commenting on Mr. Miller's paper, reported N.P.U. values for fish meals that ranged from a high of 74 to a low of 20. The true digestibility of these meals ranged from a high of 95 percent to a low of 50 percent.

ABSTRACTER: Martin Heerdt

6.1 FISH MEAL RESEARCH

Butler Charles (Fish and Wildlife Service, Washington, D. C.)
Feedstuffs 27, No. 22, 32 (May 28, 1955)

Fish-meal research is a part of the program of the Technological Section, Branch of Commercial Fisheries of the U. S. Fish and Wildlife Service. Contracts have been let to carry out meal research under the direction of various people at a number of locations in the United States. These contracts include: (1) preliminary chick-screening tests for meals of known history and laboratory evaluation of meals under the direction of C. R. Grau at the University of California, (2) direct chick assay for unknown growth factors and allied research under the direction of H. R. Bird at the University of Wisconsin, (3) nitrogen partition studies of fish meal that will assist in establishing the true protein content of a number of principal meal samples under the direction of Moses Vaugh at Maryland State College, (4) determination of the physiochemical characteristics of oil and fish meal and a chemical evaluation of the protein quality of fish meals under the direction of the Alaska Fisheries Experiment Station at Ketchikan, Alaska,(5) practical-type ration tests of selected fish meals including preliminary tests under the direction of T. D. Runnel at the University of Delaware, and (6) in-plant meal and oil studies at the plant of a major fish meal and oil producer.

Fundamental research will be furthered through (1) a study of the structure of the highly unsaturated fatty acids in fish oils by W O. Lundberg at the University of Minnesota, (2) a study of the reactions of oil in fish flesh, fish meal, and processed fish oils under the direction of Emil Mrak at the University of California, (3) fundamental research projects in fish meal and oil to be assigned to five other universities yet to be selected.

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ABSTRACTER: Martin Heerdt

6.9 SALT FROM THE SEA

Anonymous
Chemical and Engineering News 33, No. 22, 2329 (May 30, 1955)

Free flowing table salt containing all of the known mineral elements that exist in the ocean will be produced from sea water at Baffin Bay near Riviera, Texas. Baffin Bay (35 miles south of Corpus Christi) was selected for a plant site because the water there has almost twice the salinity of average sea water.

The manufacturing process which consists of chemical treatment, submerged combustion evaporation, and rotary gas drying, recovers almost 1/2 pound of salt from a gallon of water. The chemical treatment is believed to consist of the conversion of calcium and magnesium chlorides to carbonates, which are supposed to make the salt nonhydroscopic.

The sequence of operations is as follows: Water from the bay is strained and pumped into large settling basins where it loses its sand and foreign matter. The water then runs through more strainers, and into a reservoir. Finally, it is filtered and treated with chemicals. Submerged combustion of this water produces a 50 percent solids salt slurry that is then dried in a rotary gas dryer. The dry salt as it comes from the dryer is screened into various fractions. Oversize particles are ground and sent back to the sizing operation, whereas the fines are recirculated back to the dryer. The final product goes directly to storage for packing.

No specific nutritional claims have been made, but the manufacturer does point to the importance nutritionists and agronomists have attached to iodine, iron, copper, fluorine, cobalt, magnesium, zinc, molybdenum, and other minerals, particularly in areas of the country where foods are grown

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ABSTRACTER: Martin Heerdt

6.1

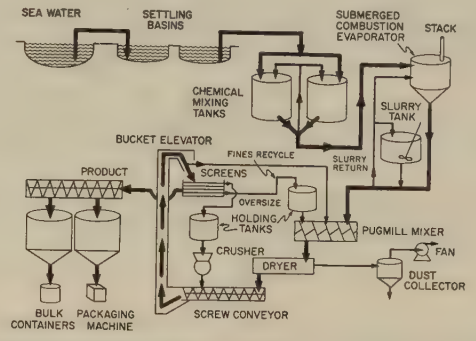
Applied research contracts have been let to study (1) the use of fish oils in high energy poultry rations under the direction of E. P. Singsen at the University of Connecticut, and (2) to carry out other applied fish meal and oil research at the University of Cincinnati, Northeastern University, Florida Southern College, and at the University of Florida.

6.9

in mineral deficient soils.

Sodium chloride is believed to be the most logical carrier for trace elements. Daily mealtime use guarantees a small but regular trace mineral intake. Trace element sea salt contains 75 percent sodium chloride and 25 percent trace elements.

Next on the manufacturers' list of products is a trace element concentrate that is essentially free of sodium chloride. This concentrate will be in production in several months. Initially, the plant will make about 100 tons of sea salt a month.



5.7 ANTIOXIDANTS PROVE EFFECTIVE IN DISEASE, SKIN STUDIES

Matterson, L. D. (University of Connecticut)
Flour and Feed 56, No. 7, 8-9 (July 1955)

Exudative diathesis in chicks is a nutritional disease that preferentially affects the adipose tissue. This fact can be demonstrated by the feeding of a synthetic vitamin E-free diet containing a relatively high amount of fish-liver oil. The disease does not occur when the diet contains sufficient vitamin E or when fat is not present in the diet.

Dam showed that the effect of the fat was associated with the highly unsaturated fatty acid fraction. If the unsaturated fats were first oxidized and then fed to the chicks, they were harmless. Dam and Grandos demonstrated the presence of peroxides in the fatty tissues of chicks coming down with exudative diathesis.

When vitamin E was present in the diet, no peroxides were found. It was therefore concluded that vitamin E exerted an antioxidant effect in vivo.

Another nutritional disease of chicks that may occur with the same diets that produce exudative diathesis is encephalomalacia (crazy-chick disease). This disease is also prevented by the presence of vitamin E in the diet.

Dam and his coworkers tried a series of compounds that were unrelated to vitamin E but that had antioxidant activity. Vitamin C, nordihydroguaiaretic acid, antabuse, and methylene blue -- although not as effective as vitamin E -- all gave some degree of protection against exudative diathesis and for encephalomalacia.

(over)

 ABSTRACTER: F. Bruce Sanford

1.0112 ANALYSIS OF THE HAWAIIAN LONG-LINE FISHERY

Otsu, Tamio (U. S. Fish and Wildlife Service, Honolulu, Hawaii)
Pan American Fisherman 9, No. 12, 18-19 (July 1955)

The Hawaiian long-line fishery had its beginning in 1917 when a Japanese immigrant introduced the Japanese technique for fishing subsurface levels in waters off Waianae, Oahu. The long-line fishery has now developed into a major source of fish in the Hawaiian Territory. Its landings are valued at more than one million dollars annually. The Pacific Oceanic Fisheries Institute of the U. S. Fish and Wildlife Service has carried out research on this fishery during the past several years. A summary of their findings include the following:

1. Long-line fishing is, at present, the only efficient method of catching the subsurface tuna and spearfishes in the vicinity of the Hawaiian Islands.

2. Tuna landings have increased steadily since World War II.

3. The tuna landings have changed during the past years from a predominance of yellowfin to one of big-eyed tuna.

4. The abundance of tuna varies markedly with the seasons. Yellowfin predominate during the summer while big-eye are more abundant in the winter. Less seasonal variation is noted among the spearfishes. Black marlin are more abundant during the summer and striped marlin in the winter.

5. The seasonal variation in yellowfin abundance may be related either to spawning or to the variation in food supply.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

9.3 GATT: GENERAL AGREEMENT ON TARIFFS AND TRADE

Anonymous
Pan American Fisherman 9, No. 12, 10-11 (July 1955)

The State Department recently announced an agreement embodying results of tariff negotiations involving Japan and 17 other countries including the United States.

The following is a tabulation of selected items on which the United States granted tariff concessions in the negotiations for the accession of Japan to GATT:

	Negotiating country	—Rate of Duty— Jan. 1 1955	Geneva 1955 agreement
Swordfish, fresh or frozen, filleted, skinned, boned, sliced, or divided into portions	Japan	1½¢ lb.	1½¢ lb
Canned tuna in oil or in oil and other substances	Japan	45%	35%
Canned tuna in brine	Japan	12½%	12½%
Clams (except razor clams) and clams in combination with other substances (except clam chowder)	Japan	45%	20%
Tuna fish, fresh or frozen, whether or not whole. Albacore	Japan	Free	Bind free
Scallops, except fresh	Japan	Free	Bind free
Oysters, not in air-tight containers (except fresh or frozen other than seed oysters)	Japan	Free	Bind free
Shellfish, n.s.p.f.	Japan	Free	Bind free

(over)

 ABSTRACTER: Kathryn L. Osterhaug

3.29 FROZEN FOODS NOT DAMAGED IN ATOM BLAST

Gould, Wilbur A. (Ohio State University)
Food Packer 36, No. 7, 24 (July 1955)

Frozen foods that were in the test area during the May 5th atom bomb explosion at Yucca Flats, Nevada were eaten safely within a few hours after the blast. These foods exhibited no physical damage and were tasty and still frozen when recovered.

Some of the samples had been placed in a home freezer in the kitchen of a concrete house 4,700 feet from ground zero. Others, for technological reasons, were buried 1,270 feet and 2,750 feet from ground zero. The frozen foods used in the test were peas, concentrated orange juice, strawberries, french-fried potatoes, chicken pot pie, and cod fillets.

Within a few days after the explosion a panel of 9 frozen food experts scored coded control samples and exposed samples for flavor, color, appearance, and texture. Two samples of each product from control, freezer, and the 1,270-foot buried location were used in the test. A total of 1,296 scores were determined by the first panel ever to grade frozen foods that had been exposed to an atomic blast. Ninety-five percent of the scores were extra fancy; the remainder, top fancy.

The exposed food samples are being analyzed for 21 vitamin, mineral and proximate components at the Wisconsin Alumni Research Foundation. Preliminary results indicate complete retention of the nutritional test factors.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

9.3 (Cross References: 1.10, 2.1120)

The concessions will become effective September 10, 1955, if by August 11 two-thirds of the contracting parties have voted favorably on Japanese accession to GATT. Japan's concessions to the United States will also become effective September 10, assuming a favorable vote on accession. Japan's concessions include a binding of the duty-free status of canned tomato paste and puree and cottonseed oil used for packing fish for export.

In the agreement, the rate of duty on fish nets valued at $0.50 a pound or more was reduced from 30 percent to 25 percent and that on nets valued at less than $0.50 a pound and on all cotton fish nettings from 40 percent to 25 percent.

Both domestic and imported cotton nets and netting have been replaced to some extent in recent years by those made of rayon and nylon. Imports declined from nearly 900,000 pounds in 1950 to more than 500,000 pounds in 1954. Japan supplied about three-quarters of the total imports of nets and netting.

3.29

AT LOS VEGAS ATOMIC BLAST, May 5: H. P. Schmitt, research director for National Association of Frozen Food Packers, checks temperature of frozen food samples which were still frozen solid after the 40-kilotron blast ripped through Doom Town (see article). Temperature dial still registers zero. Mr. Schmitt presented results of tests before the recent IFT meeting in Columbus.

5.7 (Cross Reference: 4.62)

Workers at the University of Connecticut reasoned that if an antioxidant could be found that was not absorbed by the gut and could be recovered in the feces, it would be possible to demonstrate that the effect of fat in causing encephalomalacia was in the gut and not in the body. They were fortunate in finding such an antioxidant in N,N'-diphenyl-p-phenylenediamine (DPPD). From extensive experiments that followed, it was learned that DPPD was comparable to vitamin E in effectiveness against encephalomalacia.

To complete the evidence in the hypothesis that vitamin E acts as an antiencephalomalacia agent through its antioxidant properties in the gut, the experiments injected the "insoluble" "non-absorable" DPPD intramuscularly. Contrary to expectations, DPPD was effective in reducing mortality from encephalomalacia when injected. However, it was not as effective as was vitamin E. There is a possibility that the DPPD was absorbed from the site of conversion and then reexcreted into the gut by way of the bile. From these results, it cannot be stated whether or not the deleterious effect of the fat is confined to the gut.

These studies suggest, however, that antioxidants may have a practical place in poultry rations other than as an aid in the prevention of encephalomalacia. Results of studies on the availability of vitamin A from fish oils, when DPPD is incorporated into the ration (not in the oil), shows that, at the lower levels of vitamin A supplementation, the storage in the liver is about 5 times greater when DPPD is in the ration.

The Connecticut workers tested a number of antioxidants for use in the prevention of encephalomalacia. Those that were reasonably effective are listed in table 5.

Table 5

Antioxidants that are effective in preventing experimentally induced encephalomalacia.

2, 6-di-tertiary-butyl-p-cresol, (Ionol-CP, DBPC, BHT)
N,N'-diphenyl-p-phenylenediamine, (DPPD)
2-5-ditertiary butyl hydroquinone
2-5-ditertiary amyl hydroquinone
6-ethoxy-1, 2-dihydro-2, 2, 4-trimethyl quinoline, (Santoquin)

1.0112 (Cross Reference: 1.10)

6. There seems to be a seasonal shifting of the more productive fishing grounds. Windward waters are reported to be more productive during the winter months.

7. The bulk of the long-line fishery catch of yellowfin falls between 100 and 160 pounds that of big-eye between 100 and 200 pounds. Yellowfin average around 140 and big-eye around 160 pounds.

8. Yellowfin may spend their first year or two at the surface before descending to subsurface levels. This may provide a potential method of predicting the abundance of subsurface yellowfin a few years in advance.

1.5 PREPARING FISH CAKES

Anonymous
Food Engineering 27, No. 3, 187 (March 1955)

(Abstract of this article appears under 3.5 page 11)

1.5 THE FREE AMINO-ACIDS OF FISH. I. TAURINE IN THE SKELETAL MUSCLE OF CODLING (GADUS CALLARIAS)

Jones, N. R.
Journal of the Science of Food and Agriculture 6, No. 1, 3-9 (January 1955)

(Abstract of this article appears under 7.522 page 13 - August 1955 issue)

1.5 FACTORS AFFECTING THE FREE AMINO ACID COMPOSITION OF FRESH AND ICED SKELETAL MUSCLE OF NORTH SEA CODLING (GADUS CALLARIAS)

Jones, N. R.
Biochemical Journal 58, No. 4, xlvii-xlviii (December 1954)

(Abstract of this article appears under 8.51 page 17 - May 1955 issue)

1.85 SHRIMP INDUSTRY STANDARDS OF QUALITY

Strasburger, Lawrence W.
Southern Fisherman 15, No. 1, 22, 47 (January 1955)

(Abstract of this article appears under 8.7 page 17 - July 1955 issue)

1.85 PLANT FOR THE PRODUCTION OF FROZEN BREADED SHRIMP AND FISH STICKS

Lawler, Frank K.
Food Engineering 27, No. 2, 72-76, 118-121 (February 1955)

(Abstract of this article appears under 3.237 page 15 - June 1955 issue)

1.85 MARIN INSTALLS IMMERSION FREEZING SYSTEM ON "GULF EXPLORER"

Anonymous
Southern Fisherman 15, No. 4, 101 (April 1955)

(Abstract of this article appears under 2.118 page 1)

1.85 TECHNIQUES OF FREEZING AND STORING FISH AND SEAFOOD. PART III

Butler, Charles
Frosted Food Field XX, No. 5, 12-14, 41 (May 1955)

(Abstract of this article appears under 2.118 page 7)

1.85 SKIFFS USED FOR SHRIMP FISHING IN INSIDE WATERS OF GULF OF MEXICO

Denham, S. C.
Commercial Fisheries Review 17, No. 3, 39-41 (March 1955)

(Abstract of this article appears under 2.115 page 7)

1.85 IT'S THE TEAM SPIRIT THAT COUNTS HERE

Baxter, R. P.
World Fishing 4, No. 5, 180-182 (May 1955)

(Abstract of this article appears under 9.4 page 3)

1.95 THE COMPOSITION OF WHALE-MEAT MEALS OF VARIOUS GRADES

Pritchard, H. and Cawthorne, M.
Journal of the Science of Food and Agriculture 6, No. 3, 148-153 (March 1955)

(Abstract of this article appears under 6.190 page 11 - August 1955 issue)

1.95 SOME PROBLEMS IN THE COOLING AND FREEZING OF FOODSTUFFS

Gane, R.
Chemistry and Industry, No. 4, 78-80 (January 22, 1955)

(Abstract of this article appears under 3.234 page 9 - May 1955 issue)

1.95 SALTED WHALE MEAT PRODUCED IN THE ANTARCTIC OCEAN

Nitta, T.; Okada, M.; and Umemoto, S.
Bulletin of the Japanese Society of Scientific Fisheries 15, 787-92 (1950)
Chemical Abstracts 49, No. 5, 3437 (1955)

Chem. examn. of salted whale meat produced in the Antarctic Ocean in 1948-49 was carried out.

3.17 AUREOMYCIN IN EXPERIMENTAL FISH PRESERVATION. II.

Bissett, H. M.; Tarr, H. L. A.; Boyd, J. W.; and Gillespie, D. C.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 100, 12-15 (October 1954)

(Abstract of this article appears under 3.12 page 3 - April 1955 issue)

3.17 EFFECT OF ADDITION OF AUREOMYCIN TO SEA WATER ON THE VIABLE BACTERIA PRESENT IN THE VISCERA OF LIVING FISH

Boyd, J. W.; Bissett, H. M.; and Tarr, H. L. A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 102, 4-5 (March 1955)

(Abstract of this article appears under 2.01 page 3 - July 1955 issue)

3.17 ICES CONTAINING CHLOROTETRACYCLINE IN EXPERIMENTAL FISH PRESERVATION

Gillespie, D. C.; Boyd, J. W.; Bissett, H. M.; and Tarr, H. L. A.
Food Technology 9, No. 6, 296 (June 1955)

3.234 A NEW FISH FREEZING PROCESS

Tamm, W.
Kaltetech. 6, 178-182 (1954)
Food Science Abstracts 27, No. 2, 132 (March 1955)

The principle is to freeze whole fish in ice blocks. Fresh-water fish (blue trout) were used in the experiments. The freezing machine is highly mechanized. Nine men working 3 shifts are required per 5 tons of daily output. The quality of fish frozen in blocks is stated to be superior to that of fish frozen in brine or in air.

3.234 FREEZING OF PRAWNS

Anonymous
Food Preservation Quarterly 15, No. 1, 18 (March 1955)

(Abstract of this article appears under 1.85 page 3 - August 1955 issue)

3.234 TECHNIQUES OF FREEZING AND STORING FISH AND SEAFOOD. PART III

Butler, Charles
Frosted Food Field XX, No. 5, 12-14, 41 (May 1955)

(Abstract of this article appears under 2.118 page 7)

3.4 STUDIES ON THE SALT CONCENTRATION OF COMMERCIALLY DRIED (TUYO) AND SMOKED (TINAPA) HERRING

Uyenco, V.; Rodriguez, P.; and Taruc, R.
Philippine Journal of Fisheries 2, No. 1, 85-91 (January-June 1953)

(Abstract of this article appears under 3.5 page 7 - August 1955 issue)

3.4 HERRING -- THE PORK OF THE SEA

Cutting, C. L.
Food Manufacture 30, No. 3, 113-116 (March 1955)

(Abstract of this article appears under 1.2 page 3 - August 1955 issue)

3.5 WHITE SPECKS ON VINEGAR-CURED HERRING

Truscott, Beryl and Hoogland, P. L.
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 61, 12-13 (March 1955)

(Abstract of this article appears under 3.8 page 11)

3.5 SALTING OF HERRING

Kempowa, J.
Przem. Rol. Spoz. 8, 305-307 (1954)
Food Science Abstracts 27, No. 3, 269 (May 1955)

Experiments carried out, in 1952, on two 100 kg. batches of herring, one cured with 22 kg. of salt (I), the other with 33 kg. of salt (II), showed that in I the maximum concentration of salt was reached at 51 days and in II at 42 days. Curing of the flesh was slower but superior organoleptically in I (42 days) than in II (27 days).

3.5 PREPARATION OF A SMOKED SALMON CAVIAR SPREAD

Carlson, Clarence J.
Commercial Fisheries Review 17, No. 1, 13-15 (January 1955)

(Abstract of this article appears under 3.4 page 7 - August 1955 issue)

3.5 HERRING -- THE PORK OF THE SEA

Cutting, C. L.
Food Manufacture 30, No. 3, 113-116 (March 1955)

(Abstract of this article appears under 1.2 page 3 - August 1955 issue)

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Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feedstuffs
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Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
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Journal of the American Dietetic Association
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4.11 APPLICATION OF THE CRYSTALLINE COMPOUNDS OF UREA TO THE CHEMISTRY OF FATS. III. FRACTIONATION OF FATTY ACIDS AND THEIR ESTERS THROUGH A COLUMN OF UREA

Moreno, J. Martinez; Vazquez Roncero, A.; Janer del Valle, M. L.
Anales real soc. espan. fish. y. quim. (Madrid) 49B, 539-46 (1953)
Chemical Abstracts 49, No. 6, 4305 (1955)

4.11 COMPLEXES OF UREA WITH FATTY ACIDS AND THEIR DERIVATIVES. II. EFFECTS OF SEVERAL FACTORS ON SEPARATION OF FATTY ACIDS BY UREA COMPLEXES

Sakurai, Hiroshi
J. Chem. Soc. Japan, Ind. Chem. Sect. 57, 277-9 (1954)
Chemical Abstracts 49, No. 6, 4306 (1955)

4.11 SPIRALING OF PROTEIN MOLECULES, COUNTERCURRENT DISTRIBUTION, AND PEPTIDE SYNTHESIS

Anonymous
Chemical and Engineering News 33, No. 6, 500 (February 7, 1955)

(Abstract of this article appears under 0.32 page 1 - June 1955 issue)

4.12 n-EICOSENOIC ACID IN SOME NATURAL GLYCERIDE OILS

Hopkins, C. Y. and Chisholm, Mary J.
Canadian Journal of Chemistry 32, No. 11, 1033 (November 1954)

n-Eicosenoic acid (as acid or ester) with unsaturation in the 11-12 position was isolated from the liver oil of the dogfish (Squalus acanthias L.), and the blubber oil of the beluga or white whale (Delphinapterus leucas (Pallas)). The content of eicosenoic acid is estimated as follows (% of the total fatty acids): dogfish liver 11, and beluga 4. 9-Hexadecenoic acid was identified as a constituent of dogfish liver oil and beluga oil.

4.12 BACTERICIDAL ACTIVITY OF CERTAIN FATTY ACIDS

Karabinos, J. V. and Ferlin, H. J.
Journal of the American Oil Chemists' Society 31, No. 6, 228-32 (June 1954)

4.12 SOME CAUSES OF VARIATIONS IN THE COMPOSITION OF FISH OILS

Lovern, J. A.
J. Soc. Leather Trades' Chemists 34, 7-21 (1950)
Chemical Abstracts 44, No. 14, 6660 (1950)

4.15 KITOL

Tawara, T. and Fukazawa, R.
Bulletin of the Japanese Society of Scientific Fisheries 15, 707-14 (1950)
Chemical Abstracts 49, No. 6, 4231 (1955)

I. Preparation of kitol from whale-liver oil
II. The influence of kitol fraction on the determination of international unit of vitamin A
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4.15 THE ADRIATIC ELASMOBRANCHIA LIVER OILS. IV. BIOCHEMICAL STUDY OF OILS FROM THE LIVER AND EGGS OF CENTRINA SALVIANI

Cmelik, S.
Acta Adriat. 4, 3-23 (1949)
Chemical Abstracts 44, No. 12, 5619 (1950)

4.15 CHARACTERIZATION OF FAT FROM LIVERS OF COMMERCIALLY USEFUL FISH IN THE MURMANSK REGION

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4.5 FREEZING AND COLD STORAGE OF PACIFIC NORTHWEST FISH AND SHELLFISH. PART IV. STORAGE CHARACTERISTICS OF FOUR SPECIES OF SALMONIDAE

Heerdt, M. and Stansby, M. E.
Commercial Fisheries Review 17, No. 3, 13-17 (March 1955)

(Abstract of this article appears under 3.249 page 9)

4.5 BIOCHEMISTRY - PART I

Anonymous
Report of the Food Investigation Board (Great Britain) for the Year 1953, 34-35 (1954)

(Abstract of this article appears under 0.35 page 13 - July 1955 issue)

4.5 STUDIES OF THE MECHANISM OF VITAMIN E ACTION. III. IN VITRO COPOLYMERIZATION OF OXIDIZED FATS WITH PROTEIN

Tappel, A. L.
Archives of Biochemistry and Biophysics 54, No. 2, 266 (February 1955)

(Abstract of this article appears under 0.33 page 1 - June 1955 issue)

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8.51 BASIC AMINO ACIDS AND OTHER BASIC SUBSTANCES IN THE EXTRACT OF THE CLAM

Sugino, Kiichiro; Odo, Sekine, Tara; Ichikawa, Elichi; and Watanabe, Ken-ichi
J. Chem. Soc. Japan, Pure Chem. Sect. 72, 252-5 (1951)
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Chemical Abstracts 49, No. 8, 5715 (1955)

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Duchateau, Ghislaine and Florkin, Marcel
Compt. rend. soc. biol. 148, 1287-9 (1954)
Chemical Abstracts 49, No. 6, 4044 (1955)

8.51 THE FREE AMINO-ACIDS OF FISH. I. TAURINE IN THE SKELETAL MUSCLE OF CODLING (GADUS CALLARIAS)

Jones, N. R.
Journal of the Science of Food and Agriculture 6, No. 1, 3-9 (January 1955)

(Abstract of this article appears under 7.522 page 13 - August 1955 issue)

8.51 CONTENT OF HISTIDINE, CARNOSINE, AND ANSERINE IN MUSCLE OF SOME FISH

Yudaev, N. A.
Doklady Akad. Nauk S.S.S.R. 70, 279-82 (1950)
Chemical Abstracts 45, No. 11, 4842 (1951)

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